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A. E. Nordenskiöld.

THE
VOYAGE OF THE VEGA
ROUND
ASIA AND EUROPE

BY
A. E. NORDENSKIÖLD
TRANSLATED BY ALEXANDER LESLIE

WITH STEEL PORTRAIT, MAPS AND ILLUSTRATIONS

London
MACMILLAN AND CO.
1883

■

N O T E.

THE present edition of BARON NORDENSKIÖLD'S narrative includes the whole story of the Voyage of the *Vega* along the North-East Passage, and of the year's life among the Chukches, with the details collected as to the manners and customs of that interesting people; Nordenskiöld's sketch of his own journey up the Yenisei, and of the voyage of the *Lena* up the river of that name; the chapters on the hydrography and resources of Siberia; the interesting account of animal life in and around Novaya Zemlya; and a brief sketch of the visit to Japan and the voyage home. Most of the illustrations have been retained, while the translation has been revised, and all measurements reduced to English terms.

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Engraved on Steel by G. J. Stodart.

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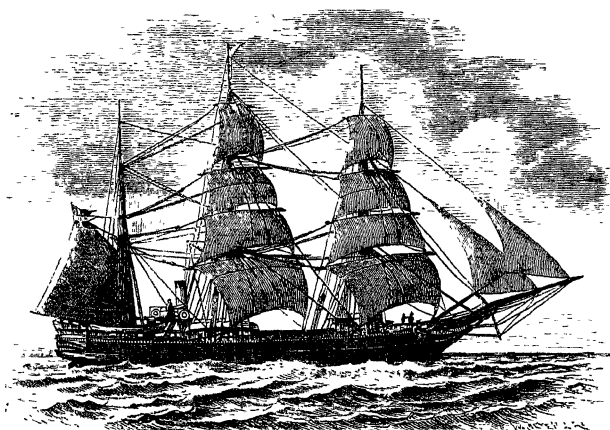
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OSCAR, II.



INTRODUCTION.

THE voyage which it is my purpose to sketch in this book, owed its origin to two preceding expeditions from Sweden to the western part of the Siberian Polar Sea, in the course of which I reached the mouth of the Yenisei, the first time in 1875 in a walrus-hunting sloop, the *Proeven*, and the second time in 1876 in a steamer, the *Ymer*.

After my return from the latter voyage, I came to the conclusion, that, on the ground of the experience thereby gained, and of the knowledge which, under the light of that experience, it was possible to obtain from previous, especially from Russian explorations of the north coast of Asia, I was warranted in asserting that the open navigable water, which two years in succession had carried me across the Kara Sea, formerly of so bad repute, to the mouth of the Yenisei, extended in all probability as far as Behring's Straits, and that a circumnavigation of the old world was thus within the bounds of possibility.

It was natural that I should endeavour to take advantage of the opportunity for making new and important discoveries which thus presented itself. An opportunity had arisen for solving a geographical problem—the forcing a north-east passage to China and Japan—which for more than three hundred years had been a subject of competition between the world's foremost commercial states and most daring navigators, and which, if we view it in the light of a circumnavigation of the old world, had, for thousands of years back, been an object of desire for geographers. I determined, therefore, at first to make use, for this purpose, of the funds which Mr. A. SIBIRIAKOFF, after my return from the expedition of 1876, placed at my disposal for the continuation of researches in the Siberian Polar Sea. For a voyage of the extent now contemplated, this sum, however, was quite insufficient. On this account I turned to His Majesty the King of Sweden and Norway, with the inquiry whether any assistance in making preparations for the projected expedition might be reckoned upon from the public funds. King OSCAR, who already, as Crown Prince, had given a large contribution to the Torell expedition of 1861, immediately received my proposal with special warmth, and promised within a short time to invite the Swedish members of the Yenisei expeditions and others interested in our voyages of exploration in the north, to meet him for the purpose of consultation, asking me at the same time to be prepared against the meeting with a complete exposition of the reasons on which I grounded my views—differing so widely from the ideas commonly entertained—of the state of the ice in the sea off the north coast of Siberia.

This meeting took place at the palace at Stockholm, on the 26th January, 1877, which may be considered the birthday of the *Vega* Expedition. It ended by His Majesty first of all declaring himself convinced of the practicability of the plan of the voyage, and prepared not only as king, but also as a private individual, to give substantial support to the enterprise. Dr. Oscar Dickson shared His Majesty's views, and promised

to contribute to the not inconsiderable expenditure, which the new voyage of exploration would render necessary. This is the sixth expedition to the high north, the expenses of which have been defrayed to a greater or less extent by Dr. O. Dickson.¹ He became the banker of the *Vega* Expedition, inasmuch as to a considerable extent he advanced the necessary funds, but after our return the expenses were equally divided between His Majesty the King of Sweden and Norway, Dr. Dickson, and Mr. Sibiriakoff.

Two officers and seventeen men of the Royal Swedish Navy having obtained permission to take part in the expedition as volunteers, I was authorised to receive on account of the expedition from the treasury of the Navy, at Karlskrona—with the obligation of returning that portion of the funds which might not be required, and on giving approved security—full sea pay for two years for the officers, petty officers, and men taking part in the expedition; pay for the medical officer, at the rate of 3,500 Swedish crowns a year, for the same time; and subsistence money for the men belonging to the Navy, at the rate of one and a half Swedish crowns per man per day. The sum, by which the cost of provisions exceeded the amount calculated at this rate, was defrayed by the expedition, which likewise gave a considerable addition to the pay of the sailors belonging to the Navy. I further obtained permission to receive on account of the expedition, from the Navy stores at Karlskrona, provisions, medicines, coal, oil, and other necessary equipment, under obligation to pay for any excess of value over 10,000 Swedish crowns (about 550*l.*); and finally the vessel of the expedition was permitted to be equipped and made completely seaworthy at the naval dockyard at Karlskrona, on condition, however, that the excess of expenditure on repairs over 25,000 crowns (about 1,375*l.*) should be defrayed by the expedition.

On the other hand my request that the *Vega*, the steamer purchased for the voyage, might be permitted to carry the man-of-war flag, was refused by the Minister of Marine in a

¹ The expeditions to Spitzbergen in 1868, to Greenland in 1870, to Spitzbergen in 1872-73, and to the Yenisei in 1875 and 1876.

letter of the 2nd February, 1878. The *Vega* was therefore inscribed in the following month of March in the Swedish Yacht Club. It was thus under its flag, *the Swedish man-of-war flag with a crowned O in the middle*, that the first circumnavigation of Asia and Europe was carried into effect.

To avoid details I shall only mention that, at the beginning of the voyage which is to be described here, the following four vessels were at my disposal :—

1. The *Vega*, commanded by Lieutenant L. Palander, of the Swedish Navy; circumnavigated Asia and Europe.

2. The *Lena*, commanded by the walrus-hunting captain, Christian Johannesen; the first vessel that reached the river Lena from the Atlantic.

3. The *Fraser*, commanded by the merchant captain, Emil Nilsson.

4. The *Express*, commanded by the merchant captain, Gundersen; the first which brought cargoes of grain from the Yenisei to Europe.¹

When the *Vega* was bought for the expedition it was described by the sellers as follows :—

“The steamer *Vega* was built at Bremerhaven in 1872-73, of the best oak, for the share-company ‘Ishafvet,’ and under special inspection. It has twelve years’ first class $\frac{3}{8}$ I.I. Veritas, measures 357 register tons gross, or 299 net. It was built and used for whale-fishing in the North Polar Sea, and strengthened in every way necessary and commonly used for that purpose. Besides the usual timbering of oak, the vessel has an ice-skin of greenheart, wherever the ice may be expected to come at the vessel. The ice-skin extends from the neighbourhood of the under chain bolts to within from 1·2 to 1·5 metres of the keel. The dimensions are :—

Length of keel	... ..	37·6 metres.
Do. over deck	... ..	43·4 „
Beam extreme	... ..	8·4 „
Depth of hold	... ..	4·6 „

¹ The first cargo of goods from Europe to the Yenisei was taken thither by me in the *Ymer* in 1876. The first vessel that sailed from the Yenisei to the Atlantic was a sloop, *The Dawn*, built at Yeniseisk, commanded by the Russian merchant captain, Schwanenberg, in 1877.

"The engine, of sixty horse-power, is on Wolff's plan, with excellent surface condensers. It requires about ten cubic feet of coal per hour. The vessel is fully rigged as a barque, and has pitch pine masts, iron wire rigging, and patent reefing topsails. It sails and manœuvres uncommonly well, and under sail alone attains a speed of nine to ten knots. During the trial trip the steamer made seven and a half knots, but six to seven knots per hour may be considered the speed under steam. Further, there are on the vessel a powerful steam winch, a reserve rudder, and a reserve propeller. The vessel is besides provided in the whole of the under hold with iron tanks so built that they lie close to the vessel's bottom and sides, the tanks thus being capable of offering a powerful resistance in case of ice pressure. They are also serviceable for holding provisions, water, and coal."¹

We had no reason to take exception to this description, but, in any case, it was necessary for an Arctic campaign, such as that now in question, to make a further inspection of the vessel, to assure ourselves that all its parts were in complete order, to make the alterations in rig, &c., which the altered requirements would render necessary, and finally to arrange the vessel so that it might house a scientific staff, which, together with the officers, numbered nine persons. This work was done at the Karlskrona naval dockyard, under the direction of Captain Palander. At the same time attention was given to the scientific equipment, principally in Stockholm, where a large number of instruments for physical, astronomical, and geological researches was obtained from the Royal Academy of Sciences.

The dietary during the expedition was fixed upon, partly on the ground of our experience from the wintering of 1872-73, partly under the guidance of a special opinion given with reference to the subject by the distinguished physician who took part in that expedition, Dr. A. Envall. Preserved provisions, butter, flour, &c., were purchased, part at Karlskrona, part in Stockholm and Copenhagen; a portion of pemmican was

¹ In order to obtain sufficient room for coal and provisions most of these tanks were taken out at Karlskrona.

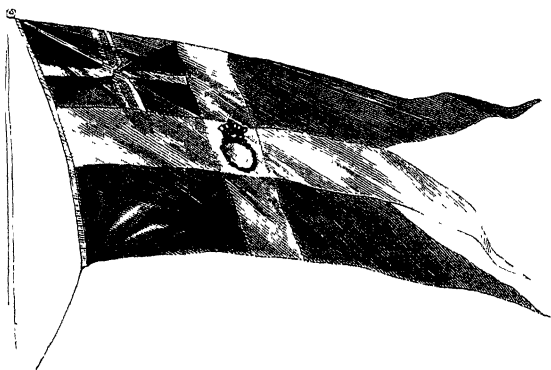
prepared in Stockholm by Z. Wikström; another portion was purchased in England; fresh ripe potatoes were procured from the Mediterranean, a large quantity of cranberry juice from Finland; preserved cloudbberries and clothes of reindeer skins, &c., from Norway, through our agent Ebeltoft, and so on—in a word, nothing was neglected to make the vessel as well equipped as possible for the attainment of the great object in view.

What this was may be seen from the following extract from the plan of the expedition, presented to his Majesty the King of Sweden and Norway, *July 1877*:—

It is my intention to leave Sweden in the beginning of July, 1878, in a steamer, specially built for navigation among ice, which will be provisioned for two years at most, and which, besides a scientific staff of four or five persons, will have on board a naval officer, a physician, and at most eighteen men—petty officers and crew, preferably volunteers, from your Royal Majesty's navy. Four walrus-hunters will also be hired in Norway. The course will be shaped at first to Matotschkin Sound, in Novaya Zemlya, where a favourable opportunity will be awaited for the passage of the Kara Sea. Afterwards the voyage will be continued to Port Dickson, at the mouth of the Yenisei, which I hope to be able to reach in the first half of August. As soon as circumstances permit, the expedition will continue its voyage from this point in the open channel which the river-water of the Obi and the Yenisei must indisputably form along the coast to Cape Chelyuskin, possibly with some short excursions towards the north-west in order to see whether any large island is to be found between the northern part of Novaya Zemlya and New Siberia.

At Cape Chelyuskin the expedition will reach the only part of the proposed route which has not been traversed by some small vessel, and this place is perhaps rightly considered as that which it will be most difficult for a vessel to double during the whole north-east passage. As Prontschischev, in 1736, in a small river craft built with insufficient means reached within a few minutes of this north-westernmost promontory of Asia, our vessel, equipped with all modern appliances, ought not to find insuperable difficulties in doubling this point, and if that be accomplished, we will probably have pretty open water towards Behring's Straits, which ought to be reached before the end of September.

If time, and the state of the ice permit, it would be desirable that the expedition during this voyage should make some excursions towards the north, in order to ascertain whether land is not to be found between Cape Chelyuskin and the New Siberian group of islands, and between it and Wrangel's Land. From Behring's Straits the course will be shaped, with such stoppages as circumstances give rise to, for some Asiatic port, from which accounts may be sent home, and then onwards round Asia to Suez. Should the expedition be prevented from forcing a passage east of Cape Chelyuskin, it will depend on circumstances which it is difficult to foresee, whether it will immediately return to Europe, in which case the vessel with its equipment and crew may be immediately available for some other purpose, or whether it ought not to winter in some suitable harbour in the bays at the mouths of the Tajmur, Pjäsina, or Yenisei. Again, in case obstacles from ice occur east of Cape Chelyuskin, a harbour ought to be sought for at some convenient place on the north coast of Siberia, from which, during the following summer, opportunities would be found for important surveys in the Polar Sea, and during the course of the summer some favourable opening will also certainly occur, when southerly winds have driven the ice from the coast, for reaching Behring's Straits. Probably also, if it be necessary to winter, there will be opportunities of sending home letters from the winter station.



CHAPTER I.

Departure—Tromsøe—Members of the Expedition—Stay at Maasøe—Limit of Trees—Climate—Scurvy and Antiscorbutics—The first doubling of North Cape—Othere's account of his Travels—Herbertstein's account of Istoma's voyage—Willoughby's voyage.

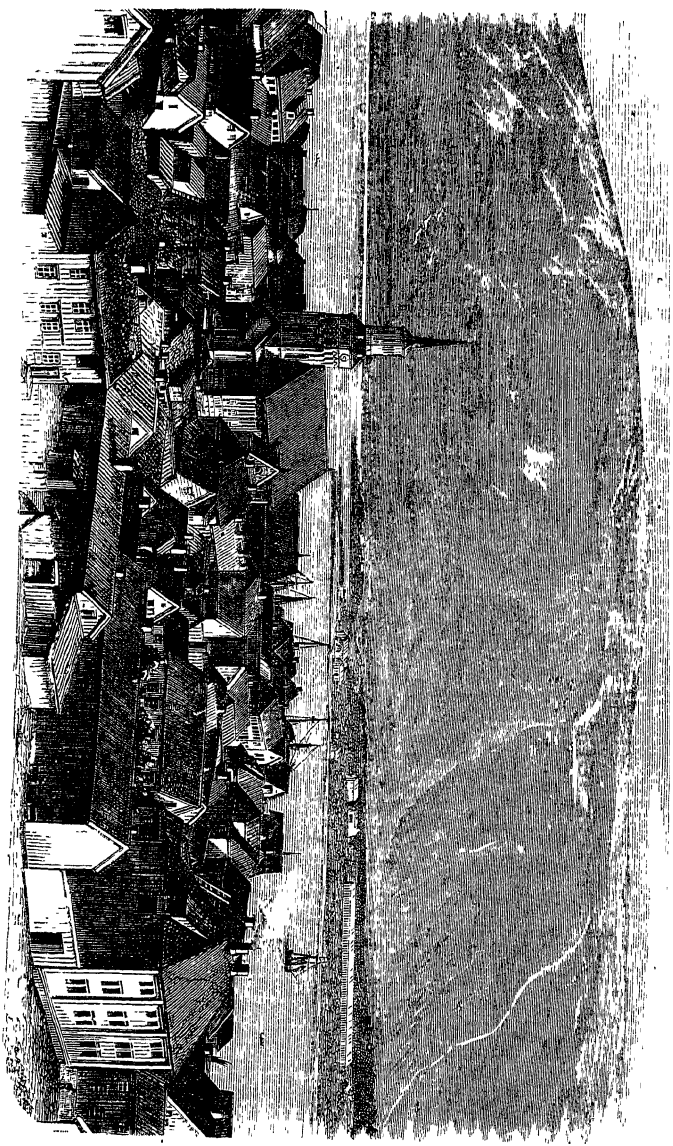
THE *Vega* left the harbour of Karlskrona on the 22nd June, 1878.

On the 24th she called at Copenhagen in order to take on board the large quantity of provisions which had been purchased there. On the 26th June the voyage was resumed, and after calling at Gothenburg, where she remained some time, the *Vega* reached Tromsøe on the 17th July. Here I went on board. Coal, water, reindeer furs for all our men, and a large quantity of other stores, bought in Finmark for the expedition, were taken in here; and three walrus-hunters, hired for the voyage, embarked.

On the 21st July the whole equipment of the *Vega* was on board, the number of its crew complete, all clear for departure, and the same day at 2.15 P.M. we weighed anchor, with lively cheers from a numerous crowd assembled at the beach, to enter in earnest on our Arctic voyage.

The members of the expedition on board the *Vega* were :—

- | | |
|---|---------------------|
| A. E. Nordenskiöld, Professor, in command of the expedition | born 18th Nov. 1832 |
| A. A. L. Palander, Lieutenant, now Captain in the Royal Swedish Navy, chief of the steamer <i>Vega</i> | „ 2nd Oct. 1840 |
| F. R. Kjellman, Ph.D., Docent in Botany in the University of Upsala, superintendent of the botanical work of the expedition | „ 4th Nov. 1846 |



TROMSØ.

After a photograph by Claus Knudsen, Christiania

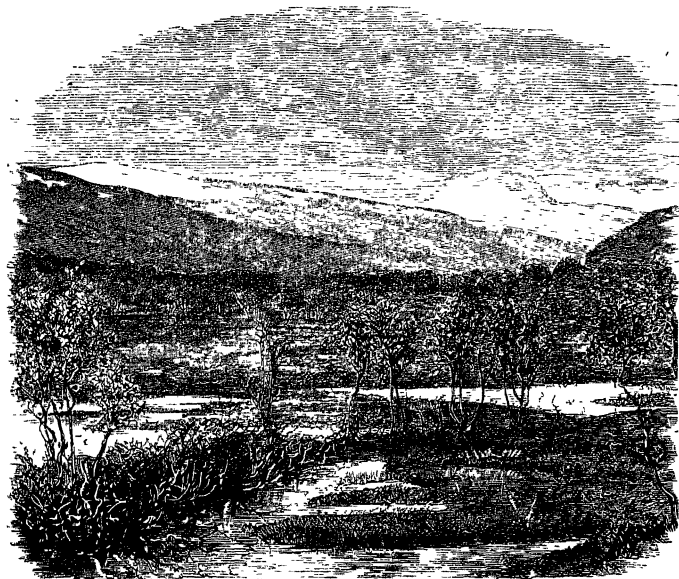
A. J. Stuxberg, Ph.D., superintendent of the zoological work	born 18th April 1849
E. Almquist, Candidate of Medicine, medical officer of the expedition, lichenologist	„ 8th Aug. 1852
E. O. Brusewitz, Lieutenant in the Royal Swedish Navy, second in command of the vessel	„ 1st Dec. 1844
G. Bove, Lieutenant in the Royal Italian Navy, superintendent of the hydrographical work of the expedition	„ 23rd Oct. 1853
A. Hovgaard, Lieutenant in the Royal Danish Navy, superintendent of the magnetical and meteorological work of the expedition	„ 1st Nov. 1853
O. Nordquist, Lieutenant in the Imperial Russian Regiment of Guards, interpreter, assistant zoologist	„ 20th May 1858
R. Nilsson, sailing-master	„ 5th Jan. 1837
F. A. Pettersson, first engineer	„ 3rd July 1835
O. Nordström, second engineer	„ 24th Feb. 1855
C. Carlström, fireman	„ 14th Dec. 1845
O. Ingelsson, fireman	„ 2nd Feb. 1849
O. Oeman, seaman	„ 23rd April 1843
G. Carlsson, seaman	„ 22nd Sep. 1843
C. Lundgren, seaman	„ 5th July 1851
O. Hansson, seaman	6th April 1856
D. Asplund, boatswain, cook	28th Jan. 1827
C. J. Smaolaenning, boatswain	27th Sept. 1839
C. Levin, boatswain, steward	24th Jan. 1844
P. M. Lustig, boatswain	22nd April 1845
C. Ljungström, boatswain	12th Oct. 1845
P. Lind, boatswain	15th Sep. 1856
P. O. Faeste, boatswain	23rd Sep. 1856
S. Andersson, carpenter	3rd Sep. 1847
J. Haugan, walrus-hunter	23rd Jan. 1825
P. Johnsen, walrus-hunter	15th May 1845
P. Sivertsen, walrus-hunter	2nd Jan. 1853
Th. A. Bostrom, assistant to the scientific men	21st Sep. 1857

The *Fraser* and *Express* had sailed several days before from Vardoe to Chaborova in Yugor Schar, where they had orders to wait for the *Vega*. The *Lena*, again, the fourth vessel that was placed at my disposal, had, in obedience to orders, awaited the *Vega* in the harbour of Tromsøe, from which port these two steamers were now to proceed eastwards in company.

After leaving Tromsøe, the course was shaped at first within the archipelago to Maosoe, where, on account of a violent north-west wind we were detained three days.

In the neighbourhood of North Cape, the wood, for the present, does not go quite to the coast of the Polar Sea, but at sheltered

places, situated at a little distance from the beach, birches,¹ three to four metres high, are already to be met with. In former times, however, the outer archipelago itself was covered with trees, which is proved by the tree-stems, found imbedded in the mosses on the outer islands on the coast of Finmark, for instance, upon



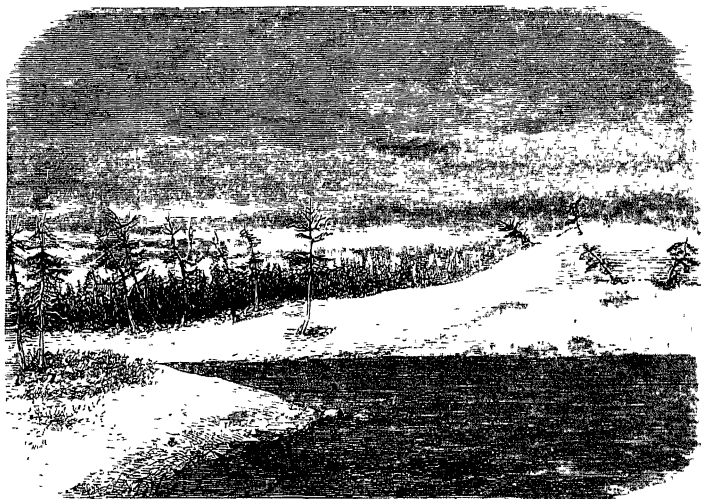
LIMIT OF TREES IN NORWAY.

At Præstevandet, on Tromsøen, after a photograph.

Renøe. In Siberia the limit of trees runs to the beginning of the estuary delta, *i.e.*, to about 72° N. L. As the latitude of North Cape is $71^{\circ} 10'$, the wood in Siberia at several places, *viz.*,

¹ The birch which grows here is the sweet-scented birch (*Betula odorata*, Bechst.), not the dwarf birch (*Betula nana*, L.), which is found as far north as Ice Fjord in Spitzbergen ($78^{\circ} 7'$ N. L.), though there it only rises a few inches above ground.

along the great rivers, goes considerably farther north than in Europe. This depends partly on the large quantity of warm water which these rivers, in summer, carry down from the south, partly on the transport of seeds by the river water, and on the more favourable soil, which consists of a rich mould, yearly renewed by inundations, whereas in Norway it consists mostly of granite and gneiss or of barren beds of sand. Besides, the



LIMIT OF TREES IN SIBERIA.
At Boganida, after Middendorf.

limit of trees presents quite a different aspect in Siberia and in Scandinavia; in the latter country, the farthest outposts of the forests towards the north consists of scraggy birches, which, notwithstanding their stunted stems, densely clothe the mountain sides with a very lively green; while in Siberia the outermost trees are gnarled and half-withered larches (*Larix dahurica* Turcz.), which rise over the tops of the hills like a thin, grey

brush. North of this limit there are to be seen on the Yenisei luxuriant bushes of willow and alder.

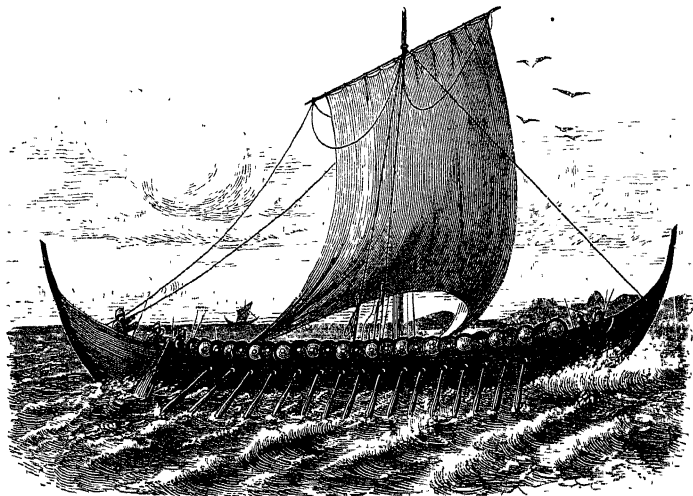
The voyage of discovery during which the northernmost point of Europe was first doubled, was accomplished about a thousand years ago by a Norwegian, OTHERE, from Halogaland or Helgeland, that part of the Norwegian coast which lies between 65° and 66° N. L. Othere, who appears to have travelled far and wide, came in one of his excursions to the court of the famous English king, Alfred the Great. In presence of this king he gave, in a simple, graphic style, a sketch of a voyage which he had undertaken from his home in Norway towards the north and east. The narrative has been preserved by its having been incorporated, along with an account of the travels of another Norseman, Wulfstan, to the southern part of the Baltic, in the first chapter of Alfred's Anglo-Saxon reproduction of the history of PAULUS OROSIVS: *De Miseria Mundi*.

It appears from Othere's simple and very clear narrative that he undertook a veritable voyage of discovery in order to explore the unknown lands and sea lying to the north-east. This voyage was also very rich in results, as in the course of it the northernmost part of Europe was circumnavigated. Nor perhaps is there any doubt that during this voyage Othere penetrated as far as to the mouth of the Dwina or at least of the Mesen in the land of the Beormas. We learn from the narrative besides, that the northernmost part of Scandinavia was already, though sparsely, peopled by Lapps, whose mode of life did not differ much from that followed by their descendants, who live on the coast at the present day.

Six hundred years, in any case, had run their course before Othere found a successor in Sir Hugh Willoughby; and it is usual to pass by the former, and to ascribe to the latter the honour of being the first in that long succession of men who endeavoured to force a passage by the north-east from the Atlantic Ocean to China.

But it may be considered certain that Norwegians, Russians, and Karelians often travelled in boats on peaceful or warlike errands, during the fifteenth and beginning of the sixteenth

century, from the west coast of Norway to the White Sea, and in the opposite direction, although we find nothing on record regarding such journeys except the account that SIGISMUND VON HERBERTSTEIN¹ gives, in his famous book on Russia, of the voyage of GREGORY ISTOMA and the envoy DAVID from the White Sea to Trondhjem in the year 1496.

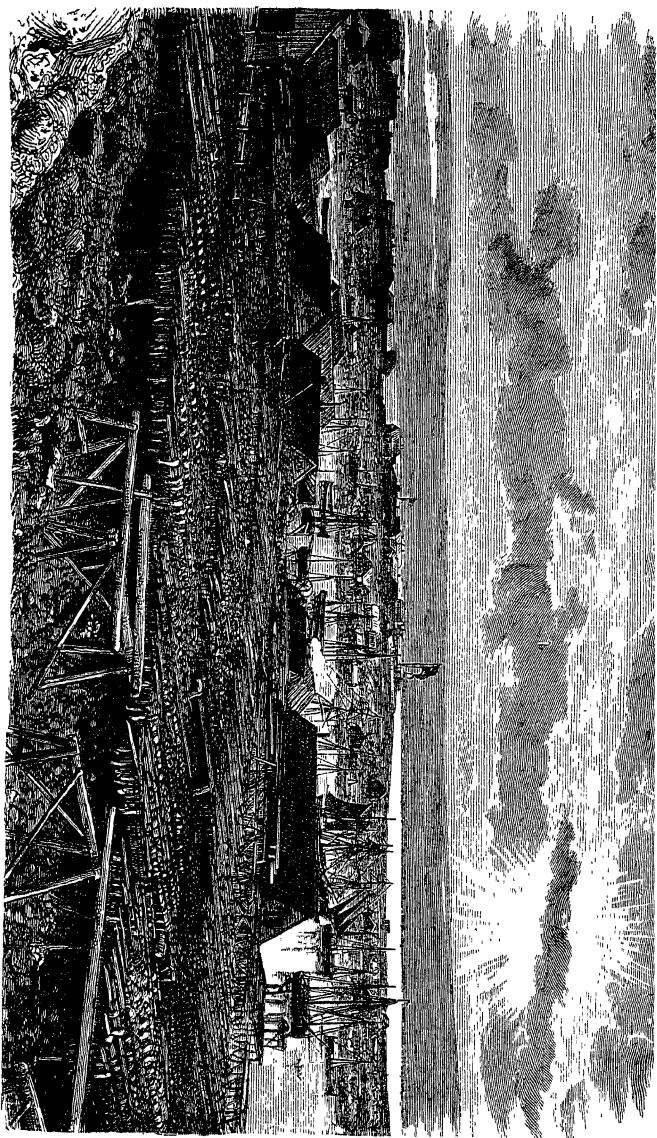


NORSE SHIP OF THE TENTH CENTURY.

Drawn with reference to the vessel found at Sandefjord in 1880, under the superintendence of Ingvald Undset, Assistant at the Christiania University's collection of Northern antiquities.

England's navigation is at present greater beyond comparison than that of any other country, but it is not of old date. In the middle of the sixteenth century it was still very inconsiderable,

¹ Von Herbertstein visited Russia as ambassador from the Roman Emperor on two occasions, the first time in 1517, the second in 1525, and on the ground of these two journeys published a sketch of the country, by which it first became known to West-Europeans, and even for Russians themselves it forms an important original source of information regarding the state of civilisation of the empire of the Czar in former times. An English translation has since been published by the Hakluyt Society.



VARDOL.
After a photograph.

and mainly confined to coast voyages in Europe, and a few fishing expeditions to Iceland and Newfoundland. The great power of Spain and Portugal by sea, and their jealousy of other countries rendered it impossible at that period for foreign seafarers to carry on traffic in the East-Asiatic countries. In order that the merchants of northern Europe might obtain a share of the profit, it appeared to be necessary to discover new routes, inaccessible to the armadas of the Pyrenean peninsula. Here lies the explanation of the zeal with which the English and the Dutch, time after time, sent out vessels, equipped at great expense, in search of a new way to India and China, either by the Pole, by the north-west, along the north coast of the new world, or by the north-east, along the north coast of the old. The voyages first ceased when the maritime supremacy of Spain and Portugal was broken. By none of them was the intended object gained, but it is remarkable that in any case they gave the first start to the development of England's ocean navigation. Sir HUGH WILLOUGHBY'S disastrous voyage in 1553 was thus the first maritime expedition undertaken on a large scale, which was sent from England to far distant seas.

■

CHAPTER II.

Departure from Maosoe—Gooseland—State of the Ice—The Vessels of the Expedition assemble at Chabarova—The Samoyed town there—The Church—Russians and Samoyeds—Visit to Chabarova in 1875—Purchase of Samoyed Idols—Dress and Dwellings of the Samoyeds—Comparison of the Polar Races—Sacrificial Places and Samoyed Grave on Vaygats Island visited.

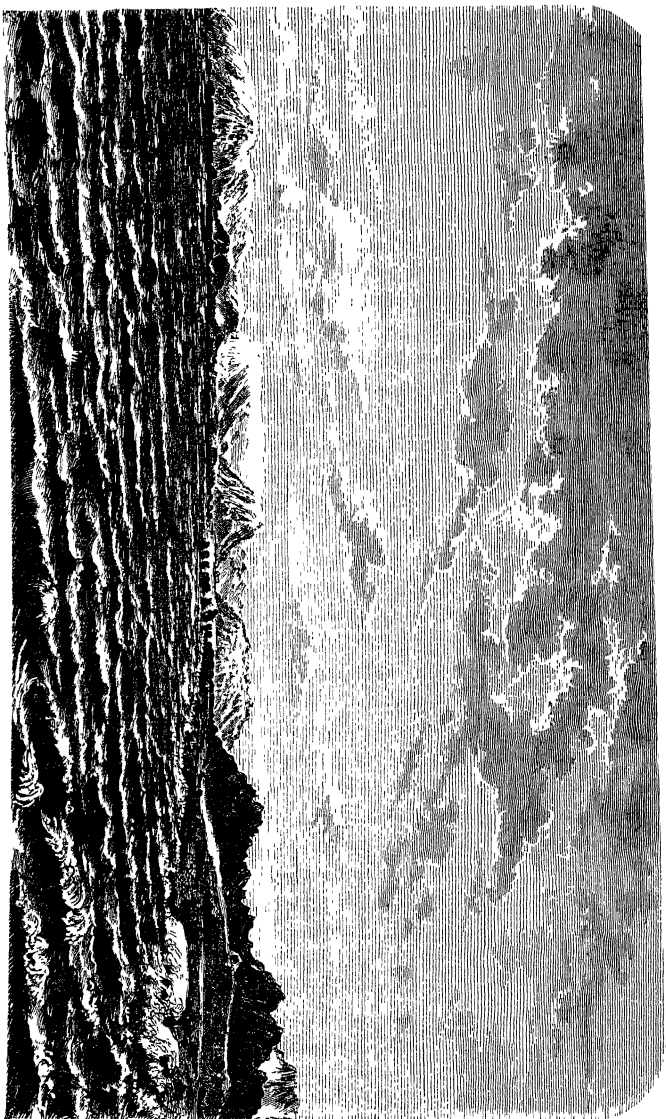
THE *Vega* was detained at Maosoe by a steady head wind, rain, fog, and a very heavy sea till the evening of the 25th July. Though the weather was still very unfavourable, we then weighed anchor, impatient to proceed on our voyage, and steamed out to sea through Mageroe Sound. The *Lena* also started at the same time, having received orders to accompany the *Vega* as far as possible, and, in case separation could not be avoided, to steer her course to the point, Chabarova in Yugor Schar, which I had fixed on as the rendezvous of the four vessels of the expedition. The first night, during the fog that then prevailed, we lost sight of the *Lena*, and did not see her again until we had reached the meeting place.

The course of the *Vega* was shaped for South Goose Cape. Although, while at Tromsøe, I had resolved to enter the Kara Sea through Yugor Schar, the most southerly of the sounds which lead to it—so northerly a course was taken, because experience has shown that in the beginning of summer so much ice often drives backwards and forwards in the bay between the west coast of Vaygats Island and the mainland, that navigation in these waters is rendered rather difficult. This is avoided

by touching Novaya Zemlya first at Gooseland, and thence following the western shore of this island and Vaygats to Yugor Schar. Now this precaution was unnecessary; for the state of the ice was singularly favourable, and Yugor Schar was reached without seeing a trace of it.

During our passage from Norway to Gooseland we were favoured at first with a fresh breeze, which, however, fell as we approached Novaya Zemlya; notwithstanding this we made rapid progress under steam. Land was sighted on the 28th July at 10.30 P.M. It was the headland which juts out from the south of Gooseland in $70^{\circ} 33' \text{ N. L.}$ and $51^{\circ} 54' \text{ E. L.}$ (Greenwich). Gooseland is a low stretch of coast, occupied by grassy flats and innumerable small lakes, which projects from the mainland of Novaya Zemlya between $72^{\circ} 10'$ and $71^{\circ} 30' \text{ N. L.}$ The name is a translation of the Russian Gusinnaya Zemlya, and arises from the large number of geese and swans (*Cygnus Bewickii*, YARR.) which breed in that region. The geese commonly place their meagre nests on little hillocks near the small lakes which are scattered over the whole of Gooseland; the powerful swans, which are very difficult of approach by the hunter, on the other hand breed on the open plain. The swans' nests are so large that they may be seen at a great distance. Along with the swans and geese, a large number of waders, a couple of species of Lestris, an owl and other birds breed on the plains of Gooseland, and a few guillemots or gulls upon the summits of the shore cliffs. The avifauna along the coast here is otherwise rather poor. At least there are none of the rich fowl-cliffs, which, with their millions of inhabitants and the conflicts and quarrels which rage amongst them, commonly give so peculiar a character to the coast cliffs of the high north. I first met with true loom and kittiwake cliffs farther north on the southern shore of Besimmanaya Bay.

Although Gooseland, seen from a distance, appears quite level and low, it yet rises gradually, with an undulating surface, from the coast towards the interior, to a grassy plain about sixty metres above the sea-level, with innumerable small lakes scattered over it. The plain sinks towards the sea nearly everywhere with a steep escarpment, ten to fifty feet high, below which there is



COAST LANDSCAPE FROM MATOTSCHEKIN SCHAR.
After Svenske.

formed during the course of the winter an immense snowdrift or so-called "snow-foot," which does not melt until late in the season. *There are no true glaciers here, nor any erratic blocks, to show that the conditions were different in former times.* Nor are any snow-covered mountain-tops visible from the sea. It is therefore possible at a certain season of the year (during the whole of the month of August) to sail from Norway to Novaya Zemlya, make sporting excursions there, and return without having seen a trace of ice or snow. This holds good indeed only of the low-lying part of the south island, but in any case it shows how erroneous the prevailing idea of the natural state of Novaya Zemlya is. By the end of June or beginning of July the greater part of Gooseland is nearly free of snow, and soon after the Arctic flower-world develops during a few weeks all its splendour of colour. Dry, favourably situated spots are now covered by a low, but exceedingly rich flower bed, concealed by no high grass or bushes. On moister places true grassy turf is to be met with, which, at least, when seen from a distance, resembles smiling meadows.

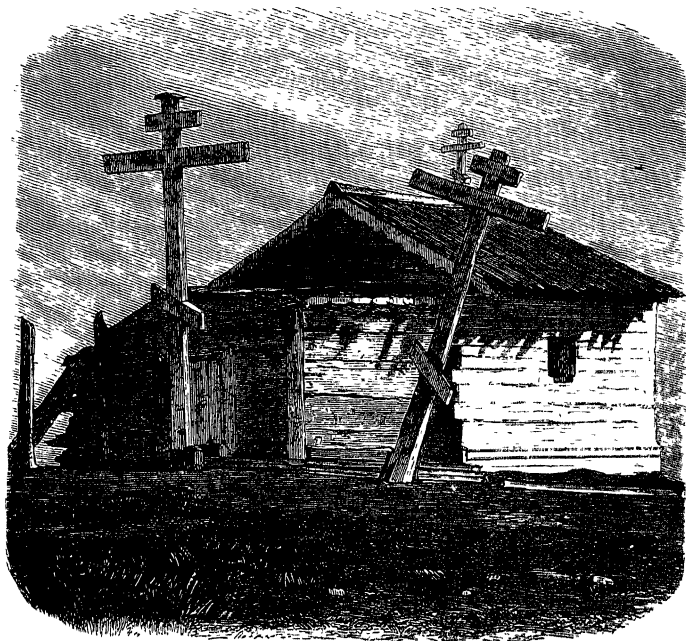
In consequence of the loss of time which had been caused by the delay in sailing along the coast of Norway, and our stay at Maosoe, we were unable to land on this occasion, but at once continued our course along the west coast of Novaya Zemlya towards Yugor Schar, the weather being for the most part glorious and calm. The sea was completely free of ice, and the land bare, with the exception of some small snow-fields concealed in the valleys. Here and there too along the steep coast escarpments were to be seen remains of the winter's snow-foot, which often, when the lower stratum of air was strongly heated by the sun, were magnified by a powerful mirage, so that, when seen from a distance, they resembled immense glaciers terminating perpendicularly towards the sea. Coming farther south the clear weather gave us a good view of Vaygats Island. It appears, when seen from the sea off the west coast, to form a level grassy plain, but when we approached Yugor Schar, low ridges were seen to run along the east side of the island, which are probably the last ramifications of the north spur of Ural, known by the name of Pai-koi.

When we were off the entrance to Yugor Schar, a steamer was sighted, and after much guessing, the *Fraser* was recognised. The *Express* and the *Fraser* had been waiting for us at the appointed rendezvous since the 20th. They had left Vardoe on the 13th, and during the passage had met with as little ice as ourselves. The *Vega* and *Fraser* now made for the harbour at Chabarova, where they anchored on the evening of the 30th July with a depth of forty-six feet and a clay bottom. On the 31st the *Lena* anchored alongside the other vessels, and thus the whole of our little Polar Sea squadron was collected at the appointed rendezvous.

Chabarova is a little village, situated on the mainland, south of Yugor Schar, west of the mouth of a small river in which at certain seasons fish are exceedingly abundant. During summer the place is inhabited by a number of Samoyeds, who pasture their herds of reindeer on Vaygats Island and the surrounding *tundra*, and by some Russians and Russianised Fins, who come hither from Pustosersk to carry on barter with the Samoyeds, and with their help to fish and hunt in the neighbouring sea. During winter the Samoyeds drive their herds to more southern regions, and the merchants carry their wares to Pustosersk, Mesen, Archangel, and other places. Thus it has probably gone on for centuries back, but it is only in comparatively recent times that fixed dwellings have been erected, for they are not mentioned in the accounts of the voyages of the Dutch in these regions.

The village, or "Samoyed town" as the walrus-hunters grandiosely call it, consists, like other great towns, of two portions, the quarter of the rich—some cabins built of wood, with flat turf-covered roofs—and that of the common people, a collection of dirty Samoyed tents. There is, besides, a little church, where, as at several places along the shore, votive crosses have been erected. The church is a wooden building, divided by a partition wall into two parts, of which the inner, the church proper, is little more than two and a half metres in height and about five metres square. On the eastern wall during the time the region is inhabited, there is a large number of sacred pictures

placed there for the occasion by the hunters. One of them, which represented St. Nicholas, was very valuable, the material being embossed silver gilt. Before the pictures hung large dented old copper lamps or rather light-holders, resembling inverted Byzantine cupolas, suspended by three chains. They



CHURCH OF CHABAROVA.

After a photograph by L. Palander.

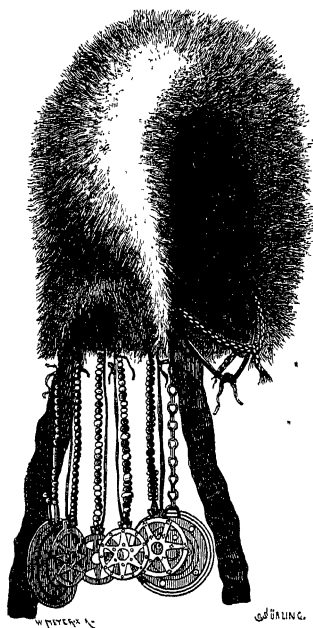
were set full of numerous small, and some few thick wax lights which were lighted on the occasion of our visit. Right above our landing-place there were lying a number of sledges laden with goods which the Russian merchants had procured by barter, and which were to be conveyed to Pustosersk the following

autumn. The goods consisted mainly of train oil and the skins of the mountain fox, common fox, Polar bear, glutton, reindeer, and seal. The bears' skins had often a very close, white winter coat, but they were spoiled by the head and paws having been cut off. Some of the wolf skins which they showed us were very close and fine. The merchants had besides collected a considerable stock of goose quills, feathers, down, and ptarmigans' wings. For what purpose these last are used I could not learn. I was merely informed that they would be sold in Archangel. Perhaps they go thence to the dealers in fashions in Western Europe, to be afterwards used as ornaments on our ladies' hats. Ptarmigans' wings were bought as long ago as 1611 at Pustosersk by Englishmen.

At the same time I saw, among the stocks of the merchants, walrus tusks and lines of walrus hide. It is noteworthy that these wares are mentioned in Othere's narrative.

I visited the place for the first time in the beginning of August, 1875. It was a Russian holiday, and, while still a long way off at sea, we could see a large number of Russians and Samoyeds standing in groups on the beach. Coming nearer we found them engaged in playing various games, and though it was the first time in the memory of man that European gentlemen had visited their "town," they scarcely allowed themselves to be more disturbed in their occupation than if some stranger Samoyeds had suddenly joined their company. Some stood in a circle and by turns threw a piece of iron, shaped somewhat like a marlin-spike, to the ground; the art consisting in getting the sharp end to strike it just in front of rings placed on the ground, in such a way that the piece of iron remained standing. Others were engaged in playing a game resembling our nine-pins; others, again, in wrestling, &c. The Russians and Samoyeds played with each other without distinction. The Samoyeds, small of stature, dirty, with matted, unkempt hair, were clad in dirty summer clothes of skin, sometimes with a showy-coloured cotton shirt drawn over them; the Russians (probably originally of the Finnish race and descendants of the old Beormas) tall, well-grown, with long hair shining with oil, ornamentally parted,

combed, and frizzled, and held together by a head band, or covered with a cap resembling that shown in the accompanying woodcut, were clad in long variegated blouses, or "mekkor," fastened at the waist with a belt. Notwithstanding the feigned indifference shown at first, which was evidently considered good



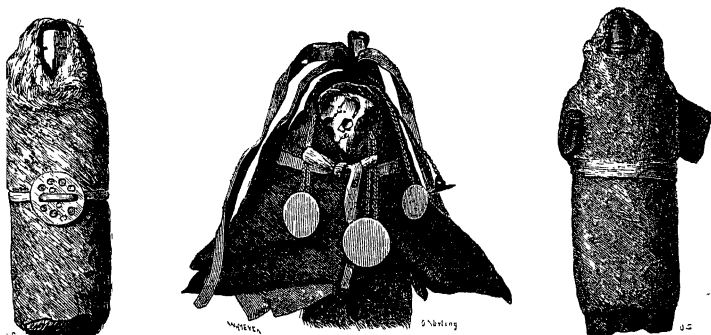
SAMOYED WOMAN'S HOOD.
One-eighth of natural size

manners, we were received in a friendly way. We were first invited to try our luck and skill in the game in turn with the rest, when it soon appeared, to the no small gratification of our hosts, that we were quite incapable of entering into competition either with Russian or Samoyed. Thereupon one of the Russians invited us to enter his cabin, where we were entertained with tea, Russian wheaten cakes of unfermented dough, and brandy. Some small presents were given us with a naive notification of what would be welcome in their stead, a notification which I with pleasure complied with as far as my resources permitted.

Immediately after the *Vega* came to anchor, I went on land on this occasion also; in the first place with a view to take some solar altitudes, in order to ascertain the chronometer's rate of going. When the observations were finished I hastened to renew my acquaintance with my old friends on the spot. I also endeavoured to purchase from the Samoyeds dresses and household articles; but as I had not then with me goods for barter, and ready money appeared to be of small account with them, prices were very high; for instance, for a lady's beautiful "pesk," twenty roubles; for a cap with brass

ornaments, ten roubles; for a pair of boots of reindeer skin, two roubles; for copper ornaments for hoods, two roubles each; and so on.

As I knew that the Samoyeds during their wanderings always carry idols with them, I asked them whether they could not sell me some. All at first answered in the negative. It was evident that they were hindered from complying with my requests partly by superstition, partly by being a little ashamed, before the West European, of the nature of their gods. The metallic lustre of some rouble pieces which I had procured in Stockholm, however, at last induced an old woman to set aside all fears. She



SAMOYED IDOLS.

One-third of natural size.

went to one of the loaded sledges, which appeared to be used as magazines, and searched for a long time till she got hold of an old useless skin boot, from which she drew a fine skin stocking, out of which at last four idols appeared. After further negotiations they were sold to me at a very high price. They consisted of a miniature "pesk," with belt, without body; a skin doll thirteen centimetres long, with face of brass; another doll, with a bent piece of copper plate for a nose; and a stone, wrapped round with rags and hung with brass plates, a corner of the stone forming the countenance of the human figure it was intended to resemble.

More finely-formed gods, dolls pretty well made, with bows forged of iron, I have seen, but have not had the good fortune to get possession of.



SAMOYED HAIR ORNAMENTS.

One-third of natural size.

When the traffic in gods was finished, though not to my full satisfaction, because I thought I had got too little, we were invited by one of the Russians, as in 1875, to drink tea in his

cabin. This consisted of a porch, and a room about four yards square, and scarcely eight feet high. One corner was occupied by a large chimney, at the side of which was the very low door, and right opposite the window opening, under which were placed some chests, serving as a tea-table for the occasion. Along the two remaining sides of the room there were fastened to the wall sleeping places of boards covered with reindeer skin. The window appeared to have been formerly filled with panes of glass, but most of these were now broken, and replaced by boards. It need not surprise us that glass is a scarce article of luxury here.

We had no sooner entered the cabin than preparations for tea commenced. Sugar, biscuits, teacups and saucers, and a brandy flask were produced from a common Russian travelling trunk. Fire was lighted, water boiled, and tea made in the common way, a thick smoke and strong fumes from the burning fuel spreading in the upper part of the low room, which for the time was packed full of curious visitors. Excepting these trifling inconveniences the entertainment passed off very agreeably, with constant conversation, which was carried on with great liveliness, though the hosts and most of the guests could only with difficulty make themselves mutually intelligible.

Hence we betook ourselves to the skin tents of the Samoyeds which stood apart from the wooden huts inhabited by the Russians. Here too we met with a friendly reception. Several of the inhabitants of the tents were now clad with somewhat greater care in a dress of reindeer skin, resembling that of the Lapps. The women's holiday dress was particularly showy. It consisted of a pretty long garment of reindeer skin, fitting closely at the waist, so thin that it hung from the middle in beautiful regular folds. The petticoat has two or three differently coloured fringes of dogskin, between which stripes of brightly coloured cloth are sewed on. The foot-covering consists of boots of reindeer skin beautifully and tastefully embroidered. During summer the men go bare-headed. The women then have their black straight hair divided behind into two tresses, which are braided with straps, variegated ribbons and beads, which are continued beyond the point where the hair ends as an artificial

prolongation of the braids, so that, including the straps which form this continuation, loaded as they are with beads, buttons, and metal ornaments of all kinds, they nearly reach the ground. The



SAMOYED WOMAN'S DRESS.

After a drawing by Hj. Theel.

whole is so skilfully done, that at first one is inclined to believe that the women here were gifted with a quite incredible growth of hair. A mass of other bands of beads ornamented with buttons was besides often intertwined with the hair in a very

tasteful way, or fixed to the perforated ears. All this hair ornamentation is naturally very heavy, and the head is still more weighed down in winter, as it is protected from the cold by a thick and very warm cap of reindeer skin, bordered with dogskin, from the back part of which hang down two straps set full of heavy plates of brass or copper.

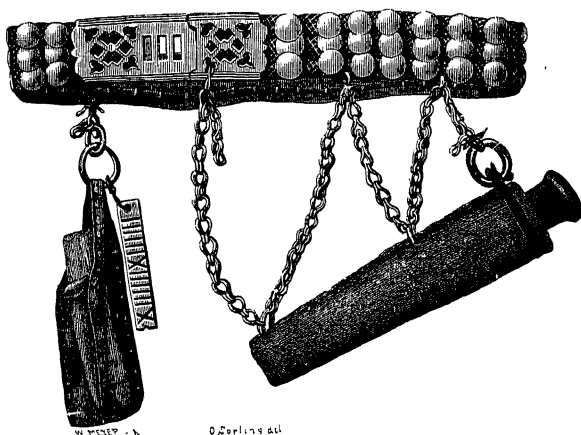
The young woman also, even here as everywhere else, bedecks herself as best she can; but fair she certainly is not in our eyes. She competes with the man in dirt. Like the man she is small of stature, has black coarse hair resembling that of a horse's mane or tail, face of a yellow colour, often concealed by dirt, small, oblique, often running and sore eyes, a flat nose, broad projecting cheekbones, slender legs and small feet and hands.

The dress of the man, which resembles that of the Lapps, consists of a plain, full and long "pesk," confined at the waist with a belt richly ornamented with buttons and brass mounting, from which the knife is suspended. The boots of reindeer skin commonly go above the knees, and the head covering consists of a closely fitting cap, also of reindeer skin.

The summer tents, the only ones we saw, are conical, with a hole in the roof for carrying off the smoke from the fireplace, which is placed in the middle of the floor. The sleeping places in many of the tents are concealed by a curtain of variegated cotton cloth. Such cloth is also used, when there is a supply of it, for the inner parts of the dress. Skin, it would appear, is not a very comfortable material for dress, for the first thing, after fire-water and iron, which the skin-clad savage purchases from the European, is cotton, linen, or woollen cloth.

Of the Polar races, whose acquaintance I have made, the reindeer Lapps undoubtedly stand highest; next to them come the Eskimo of Danish Greenland. Both these races are Christian and able to read, and have learned to use and require a large number of the products of agriculture, commerce, and the industrial arts of the present day, as cotton and woollen cloth, tools of forged and cast iron, firearms, coffee, sugar, bread, &c. They are still nomads and hunters, but cannot be called savages; and the educated European who has lived among them for a

considerable time commonly acquires a liking for many points in their natural disposition and mode of life. Next to them in civilisation come the Eskimo of North-western America, on whose originally rough life contact with the American whalers appears to have had a very beneficial influence. I form my judgment from the Eskimo tribe at Port Clarence. The members of this tribe were still heathens, but a few of them were far travelled, and had brought home from the Sandwich Islands not only

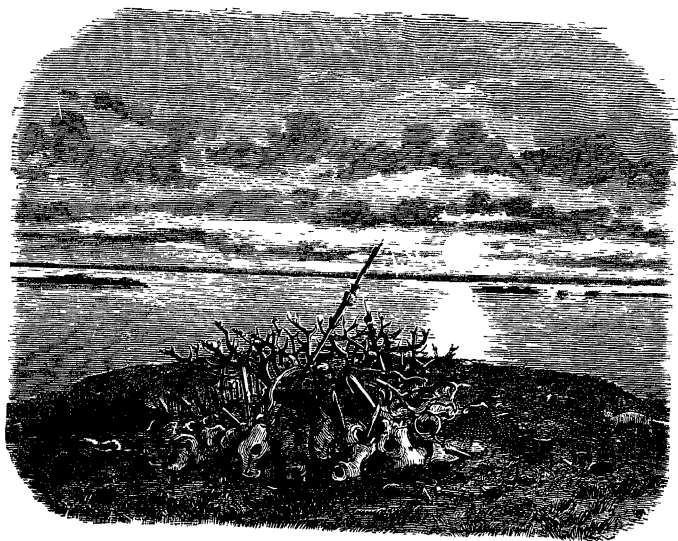


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 SAMOYED BELT WITH KNIFE.
 One-sixth of natural size.

cocoa-nuts and palm mats, but also a trace of the South Sea islander's greater love for ornament and order. Next come the Chukchis, who have as yet come in contact with men of European race to a limited extent, but whose resources appear to have seriously diminished in recent times, in consequence of which the vigour and vitality of the tribe have decreased to a noteworthy extent. Last of all come the Samoyeds, or at least the Samoyeds who inhabit regions bordering on countries inhabited by the Caucasian races; on them the influence of the higher race, with

its regulations and ordinances, its merchants, and, above all, its fire-water, has had a distinctly deteriorating effect.

When I once asked an Eskimo in North-western Greenland, known for his excessive self-esteem, whether he would not admit that the Danish Inspector (Governor) was superior to him, I got for answer: "That is not so certain: the Inspector has, it is true, more property, and appears to have more power, but there



SACRIFICIAL EMINENCE ON VAYGATS ISLAND.

After a drawing by A. Hovgaard.

are people in Copenhagen whom he must obey. I receive orders from none." The same haughty self-esteem one meets with in his host in the "gamma" of the reindeer Lapp, and the skin tent of the Chukchi. In the Samoyed, on the other hand, it appears to have been expelled by a feeling of inferiority and timidity, which in that race has deprived the savage of his most striking characteristics.

I knew from old travels and from my own experience on Yalmal, that another sort of gods, and one perhaps inferior to those which Anna Petrovna pulled out of her old boot, was to be found set up at various places on eminences strewn with the bones of animals that had been offered in sacrifice. Our Russian host informed us the Samoyeds from far distant regions are accustomed to make pilgrimages to these places in order to offer sacrifices and make vows. They eat the flesh of the animals they sacrifice, the bones are scattered over the sacrificial height, and the idols are besmeared with the blood of the sacrificed animal. I immediately declared that I wished to visit such a place. But for a long time none of the Russians who were present was willing to act as guide. At last however a young man offered to conduct me to a place on Vaygats Island, where I could see what I wished. Accordingly the following day, accompanied by Dr. Almquist, Lieutenant Hovgaard, Captain Nilsson, and my Russian guide, I made an excursion in one of the steam launches to the other shore of Yugor Straits.

The sacrificial eminence was situated on the highest point of the south-western headland of Vaygats Island, and consisted of a natural hillock which rose a couple of metres above the surrounding plain. The plain terminated towards the sea with a steep escarpment. The land was even, but rose gradually to a height of eighteen metres above the sea. The sacrificial mound consisted of a cairn of stones some few yards square, situated on a special elevation of the plain. Among the stones there were found :—

1. Reindeer skulls, broken in pieces for the purpose of extracting the brains, but with the horns still fast to the coronal bone; these were now so arranged among the stones that they formed a close thicket of reindeer horns, which gave to the sacrificial mound its peculiar character.

2. Reindeer skulls with the coronal bone bored through, set up on sticks which were stuck in the mound. Sometimes there was carved on these sticks a number of faces, the one over the other.

3. A large number of other bones of reindeer, among them marrow bones, broken for the purpose of extracting the marrow.

4. Bones of the bear, among which were observed the paws and the head, only half flayed, of a bear which had been shot so recently that the flesh had not begun to decompose; alongside of this bear's head there were found two lead bullets placed on a stone.

5. A quantity of pieces of iron, for instance, broken axes, fragments of iron pots, metal parts of a broken harmonicon, &c.; and finally,

6. The mighty beings to which all this splendour was offered.

They consisted of hundreds of small wooden sticks, the upper portions of which were carved very clumsily in the form of the human countenance, most of them from six to eight, but some of them 145 inches in length. They were all stuck in the ground on the south-east part of the eminence. Near the place of sacrifice there were to be seen pieces of drift-wood and remains of the fireplace at which the sacrificial meal was prepared. Our guide told us that at these meals the mouths of the idols were besmeared with blood and wetted with brandy, and the former statement was confirmed by the large spots of blood which were found on most of the large idols below the holes intended to represent the mouth.

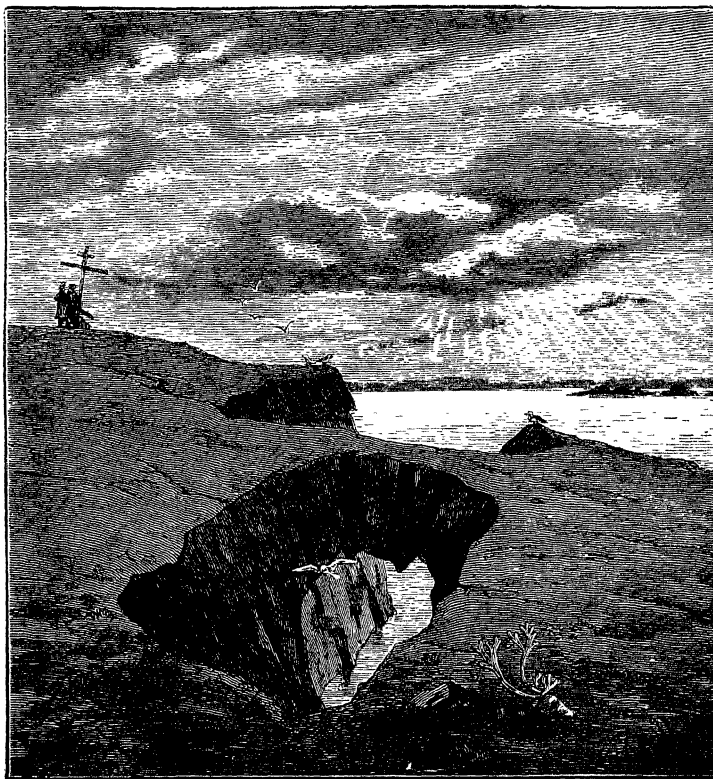
After a drawing had been made of the mound, we robbed it discreetly, and put some of the idols and the bones of the animals offered in sacrifice into a bag which I ordered to be carried down to the boat. My guide now became evidently uncomfortable, and said that I ought to propitiate the wrath of the "bolvens"



IDOLS FROM THE SACRIFICIAL CAIRN.

One-twelfth of natural size.

by myself offering something. I immediately said that I was ready to do that, if he would only show me how to go to work. A little at a loss, and doubting whether he ought to be more



SACRIFICIAL CAVITY ON VAYGATS ISLAND.

After a drawing by A. Hovgaard.

afraid of the wrath of the "bolvans" or of the punishment which in another world would befall those who had sacrificed to false gods, he replied that it was only necessary to place some

small coins among the stones. With a solemn countenance I now laid my gift upon the cairn. It was certainly the most precious thing that had ever been offered there, consisting as it did of two silver pieces. The Russian was now satisfied, but declared that I was too lavish, "a couple of copper coins had been quite enough."



SAMOYED GRAVE ON VAYGATS ISLAND.

The following day the Samoyeds came to know that I had been shown their sacrificial mound. For their own part they appeared to attach little importance to this, but they declared that the guide would be punished by the offended "bolvans." He would perhaps come to repent of his deed by the following autumn, when his reindeer should return from Vaygats Island, where they for the present were tended by Samoyeds; indeed if punishment did not befall him now, it would reach him in the

future and visit his children and grandchildren—certain it was that the gods would not leave him unpunished. In respect to God's wrath their religious ideas were thus in full accordance with the teaching of the Old Testament.

This place of sacrifice was besides not particularly old, for there had been an older place situated 660 yards nearer the shore, beside a grotto which was regarded by the Samoyeds with superstitious veneration.

After I had completed my examination and collected some contributions from the old sacrificial mound, I ordered a little boat, which the steam launch had taken in tow, to be carried over the sandy neck of land which separates the lake shown on the map from the sea, and rowed with Captain Nilsson and my Russian guide to a Samoyed burying-place farther inland by the shore of the lake.

Only one person was found buried at the place. The grave was beautifully situated on the sloping beach of the lake, now gay with numberless Arctic flowers. It consisted of a box carefully constructed of broad stout planks, fixed to the ground with earthfast stakes and cross-bars, so that neither beasts of prey nor lemmings could get through. The planks appeared not to have been hewn out of drift-wood, but were probably brought from the south, like the birch bark with which the bottom of the coffin was covered. As a "pesk," now fallen in pieces, lying round the skeleton, and various rotten rags showed, the dead body had been wrapped in the common Samoyed dress. In the grave were found besides the remains of an iron pot, an axe, knife, boring tool, bow, wooden arrow, some copper ornaments, &c. Rolled-up pieces of bark also lay in the coffin, which were doubtless intended to be used in lighting fires in another world. Beside the grave lay a sleigh turned upside down, evidently placed there in order that the dead man should not, away there, want a means of transport, and it is probable that reindeer for drawing it were slaughtered at the funeral banquet.

CHAPTER III.

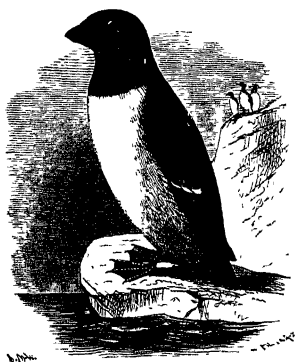
The Animal World of Novaya Zemlya—The Fulmar Petrel—The Rotge or Little Auk—Brünnich's Guillemot—The Black Guillemot—The Arctic Puffin—The Gulls—Richardson's Skua—The Tern—Ducks and Geese—The Swan—Waders—The Snow Bunting—The Ptarmigan—The Snowy Owl—The Reindeer—The Polar Bear—The Mountain Fox—The Lemming—Insects—The Walrus—The Seal—Whales.

IF we do not take into account the few Samoyeds who of recent years have settled on Novaya Zemlya or wander about during summer on the plains of Vaygats Island, all the lands which in the old world have formed the field of research of the Arctic explorer—Spitzbergen, Franz-Josef Land, Novaya Zemlya, Vaygats Island, the Taimur Peninsula, the New Siberian Islands, and perhaps Wrangel's land also—are uninhabited. The pictures of life and variety, which the native, with his peculiar manners and customs, commonly offers to the foreigner in distant foreign lands, are not to be met with here. But, instead, the animal life, which he finds there in summer—for during winter almost all beings who live above the surface of the sea disappear from the highest North—is more vigorous and perhaps even more abundant, or, to speak more correctly, less concealed by the luxuriance of vegetation than in the south.

It is not, however, the larger mammalia—whales, walruses, seals, bears, and reindeer—that attract attention in the first place, but the innumerable flocks of birds that swarm around the Arctic traveller during the long summer day of the North.

Long before one enters the region of the Polar Sea proper, the

vessel is surrounded by flocks of large grey birds which fly, or rather hover without moving their wings, close to the surface of the sea, rising and sinking with the swelling of the billows, eagerly searching for some eatable object on the surface of the water, or swim in the wake of the vessel in order to snap up any scraps that may be thrown overboard. It is the Arctic *stormfogel* (Fulmar, "Mallemuck," "Hafhaest," *Procellaria glacialis*, L.). The Fulmar is bold and voracious, and smells villanously, on which account it is only eaten in cases of necessity, although its flesh, if the bird has not recently devoured too much rotten blubber, is by no means without relish, at least for those who have become accustomed to the flavour of train oil, when not too strong. It is more common on Bear Island and Spitzbergen than on Novaya Zemlya, and scarcely appears to breed in any considerable numbers on the last-named place.



THE LITTLE AUK, OR ROTGE.
Swedish, Alkekung. (*Mergulus alle*, L.)

When the navigator has gone a little further north and come to an ice-bestrewed sea, the swell ceases at once, the wind is hushed and the sea becomes bright as a mirror, rising and sinking with a slow, gentle heaving. Flocks of little auks (*Mergulus alle*, L.), Brünnich's guillemots (*Uria Brünnichii*, Sabine), and black guillemots (*Uria grylle*, L.) now swarm in the air and swim among the ice floes. The *alke-kung* (little auk), also called the "sea king," or rotge, occurs only sparingly off the southern part of Novaya Zemlya, and does not, so far as I know, breed there. But on Spitzbergen it occurs in incredible numbers, and breeds in the talus, 320 to 650 feet high, which frost and weathering have formed at several places on the steep slopes of the coast mountain sides. If we climb up among the stones, we see at intervals actual clouds of fowl suddenly emerge from the ground either to



BREEDING-PLACE FOR LITTLE AUKS.

FOOT BOY, on the West Coast of Spitzbergen, after a photograph taken by A. Envall on the 30th August, 1872.

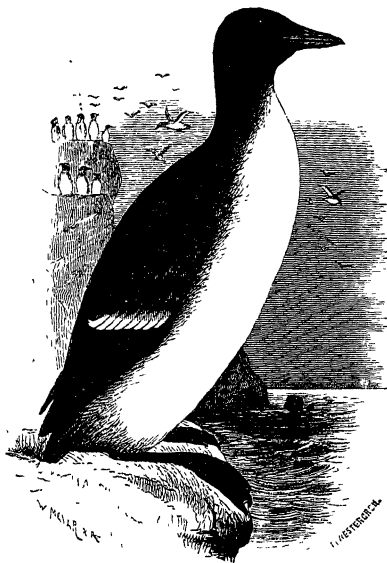
swarm round in the air or else to fly out to sea, while those that remain make their presence underground known by a ceaseless cackling and din, resembling, according to Friedrich Martens, the noise of a crowd of quarrelling women. The fowl circling in the air soon settle again on the stones of the mountain slopes, where, squabbling and fighting, they pack themselves so close together that from fifteen to thirty of them may be killed by a single shot. A portion of the flock now flies up again, others seek their safety like rats in concealment among the blocks of stone. But they soon creep out again, in order, as if by agreement, to fly out to sea and search for their food, which consists of crustacea and vermes. The rotge dives with ease. Its single blueish-white egg is laid on the bare ground without a nest, so deep down among the stones that it is only with difficulty that it can be got at. Where the main body of these flocks of birds passes the winter is unknown,¹ but they return to the north early—sometimes too early. When cooked the rotge tastes exceedingly well.

Along with the rotge we find among the ice far out at sea flocks of *alkor* (looms, or Brünnich's guillemots), and the nearer we come to the coast, the more do these increase in number, especially if the cliffs along the shore offer to this species of sea-fowl—the most common in the Arctic lands—convenient hatching places. On the guillemot cliffs proper, eggs lie beside eggs in close rows from the crown of the cliff to near the sea level, and the whole fell is also closely covered with sea-fowl, flocks of thousands and thousands flying to and from the cliffs, filling the air with their exceedingly unpleasant scream. The eggs are laid, without trace of a nest, on the rock. Each bird has but one very large egg, grey pricked with brown, of very variable size and form. After it has been sat upon for some time, it is covered with a thick layer of bird's dung, and in this way the hunters are accustomed to distinguish uneatable eggs from fresh.

An unceasing, unpleasant cackling noise indicates that a

¹ It deserves investigation whether some little auks do not, like the Spitzbergen ptarmigan, pass the winter in their stone mounds, flying out to sea only at pretty long intervals in order to collect their food.

continual gossip goes on in the "loomery"; and that the unanimity there is not great, is proved by the angry screams which are heard now and then. The loom breeds on Walden Island and the north coast of North-East land, accordingly far north of 80°. I found the largest "loomeries" on Spitzbergen south of Lomme Bay in Hinloopen Strait, at the southern entrance to



THE LOOM, OR BRÜNNICH'S GUILLEMOT.
Swedish, Alka. (*Uria Brünnichii*, Sabine.)

Van Meyen Bay in Bell Sound, and at Alkornet in Ice Fjord. In numbers, however, only the first of these can compete with the south shore of Besimannaya Bay (72° 54' N. L.) and with the part of Novaya Zemlya that lies immediately to the south of this bay. The eggs of the loom are palatable, and the flesh is excellent, though not quite free from the flavour of train oil. In any case it tastes much better than that of the eider.

Along with the rotge and the loom two nearly allied species of birds, *lunnefogeln*, the Arctic puffin (*Mormon arcticus*, L.) and *tejsten* or *tobis-grisslan*, the black guillemot (*Uria grylle*, L.) are to be seen among the drift-ice. I do not know any puffin-cliffs on Spitzbergen. The bird appears to breed there only in small numbers, though it is still found on the most northerly part of the island. On Novaya Zemlya, too, it occurs rather sparingly. The black guillemot, on the other hand, is found everywhere,



THE ARCTIC PUFFIN.

Swedish, Lunnefogel. (*Mormon arcticus*, L.)

THE BLACK GUILLEMOT.

Swedish, Tejst. (*Uria grylle*, L.)

though never collected in large flocks, along the shores of Spitzbergen and Novaya Zemlya, even as far north as Parry Island in $80^{\circ} 40' N.$ L., where in 1861 I saw several of their nests. These are placed near the summits of steep cliffs along the shore. The black guillemots often swim out together in pairs in the fjords. Their flesh has much the same taste as Brännich's guillemot, but is tougher and of inferior quality; the eggs on the other hand are excellent.

While sailing in the Arctic Ocean, vessels are nearly always attended by two kinds of gulls, the greedy *stormaosen* or *borgmaesteren*, glaucous gull (*Larus glaucus*, Brunn.), and the gracefully formed, swiftly flying *kryckian* or *tretaioiga maosen*, kittiwake (*Larus tridactylus*, L.), and if the hunter lies to at an ice-floe to flense upon it a seal which has been shot, it is not long till a large number of snow-white birds with dark blue bills and black legs settle down in the neighbourhood in order that they may get a portion of the spoil. They belong to the third kind of gull common in the north, *ismaosen*, the ivory gull (*Larus eburneus*, Gmel.).

In disposition and mode of life these gulls differ much from each other. The glaucous gull is sufficiently strong to be able to defend its eggs and young against the attack of the mountain fox. It therefore breeds commonly on the summits of easily accessible small cliffs, hillocks or heaps of stones, preferably in the neighbourhood of "loomeries" or on fowl-islands, where the young of the neighbouring birds offer an opportunity for prey and hunting during the season when its own young are being fed. The nests, which, to judge from the quantity of birds' dung in their neighbourhood, are used for a long succession of years, are placed in a depression in the rock or the ground, and lined with a little straw or a feather or two. The number of the eggs is three or four; they are exceedingly delicious. The young birds have white flesh, resembling chicken. The burgomaster is common everywhere along the coasts of Novaya Zemlya and Spitzbergen. Yet I have not seen the nest of this gull on the north coast of North-East Land or on the Seven Islands.

Still more common than the glaucous gull in the lands of the High North is *kryckian*, the kittiwake. It is met with far out at sea, where it accompanies the vessel whole days. It breeds in great flocks on the steep escarpments in some detached part of the fowl-cliffs. Among the birds of the north the kittiwake is the best builder; for its nest is walled with straw and mud, and is very firm. It juts out like a great swallow's nest from the little ledge to which it is fixed. Projecting ends of straw are mostly bent in, so that the nest, with its regularly rounded

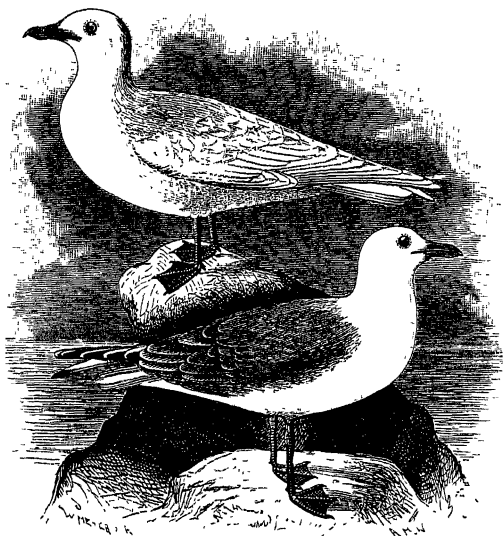


BREEDING-PLACE FOR GLAUCOUS GUILLS.

Borgmestereport on Bear Island, after a midnight photograph taken by the Author on the 15th—19th June, 1894

form, has a very tidy appearance. The interior is further lined with a soft, carefully arranged layer of moss, grass and seaweed, on which the bird lays three to four well-flavoured eggs.

The ivory gull, called by Fr. Martens "Rathsherr," the Councillor, is found, as its Swedish name indicates, principally out at sea, in the pack, or in fjords filled with drift-ice. It is a



A. THE KITTIWAKE.

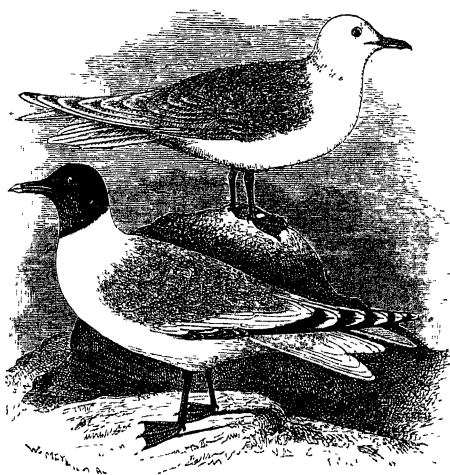
Swedish, Kryckia. (*Larus tridactylus*, L.)

B THE IVORY GULL.

Swedish, Ismaos. (*Larus eburneus*, L.)

true ice-bird, and, it may almost be said, scarcely a water-bird at all, for it is seldom seen swimming on the surface, and it can dive as little as its relatives, the glaucous gull and the kittiwake. In greed it competes with the fulmar. The proper breeding-places of this bird scarcely appear to be yet known. Common as it is both on the coasts of Spitzbergen from the Seven Islands to South Cape and on the north coast of Novaya Zemlya and

America, its nest has only been found twice, once in 1853 by McClintock at Cape Krabbe in North America in $77^{\circ} 25' N. L.$, the second time by Dr. Malmgren at Murchison Bay, in $82^{\circ} 2' N. L.$ The two nests that Malmgren found consisted of depressions, twenty-three to twenty-six centimetres in diameter, in a heap of loose gravel, on a ledge of a steeply-sloping limestone-rock wall. In each nest was found only one egg, which, on the 30th July, already contained a down-covered young bird. I



RARE NORTHERN GULLS.

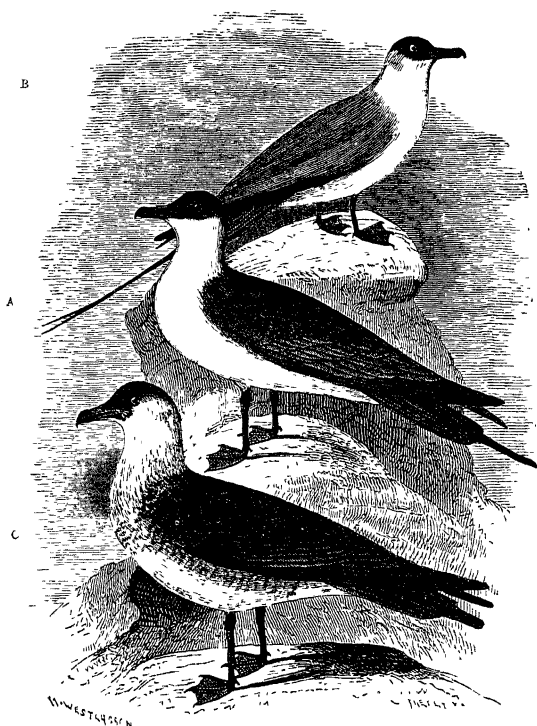
A. Sabine's Gull. (*Larus Sabini*, Sabine.) B. Ross's Gull. (*Larus Rossii*, Richards.)

assume that its proper breeding-place must be found farther north, on the shores of some still unknown Polar land, perhaps continually surrounded by ice.

Besides these varieties of the gull, two other species have been found, though very rarely, in the Polar regions, viz., *Larus Sabini*, Sabine, and *Larus Rossii*, Richards.

Often during summer in the Arctic regions one hears a penetrating shriek in the air. It is found to proceed from a

kittiwake, more rarely from a glaucous gull, eagerly pursued by a bird as large as a crow, dark brown, with white breast, and long tail-feathers. It is *labben*, the common skua (*Lestris*



A. THE COMMON SKUA.

Swedish, Labben. (*Lestris parasitica*, L.)

B BUFFON'S SKUA.

Swedish, Fjellabben. (*Lestris Buffonii*, Boie)

C. THE POMARINE SKUA.

Swedish, Bredstjertade Labben. (*Lestris pomarina*, Tem.)

parasitica, L.), known by the Norwegian walrus-hunters under the name of *tjufjo*, derived from the bird's cry, "*I-o-i-o*," and its shameless thief-nature. When the "*tjufjo*" sees a kittiwake

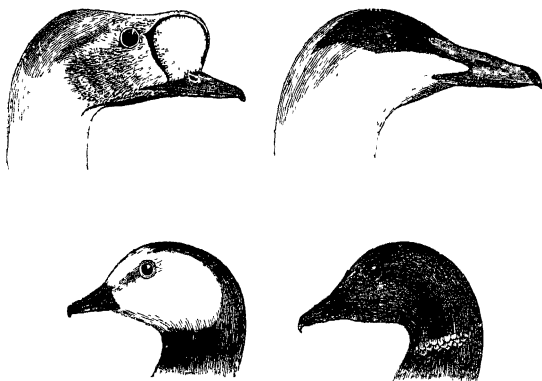
or a glaucous gull fly off with a shrimp, a fish, or a piece of blubber, it instantly attacks it. It flies with great swiftness backwards and forwards around its victim, striking it with its bill, until the attacked bird either drops what it has caught, which is then immediately snapped up by the skua, or else settles down upon the surface of the water, where it is protected against attack. The skua besides eats eggs of other birds, especially of eiders and geese. With incredible dexterity it pecks a hole in the eggs and sucks their contents. If speed is necessary, this takes place so quickly and out of so many eggs in succession that it sometimes has to stand without moving, unable to fly further until it has thrown up what it had swallowed. The skua breeds upon low, unsheltered, often water-drenched headlands and islands, where it lays one or two eggs on the bare ground, often without trace of a nest. The eggs are so like the ground that it is only with difficulty that they can be found. This bird is very common on Spitzbergen and Novaya Zemlya.

Along with the bird now described there occur, though sparingly, two others:—*bredstjertade labben*, the Pomarine skua (*Lestris pomarina*, Tem.) and *fjellabben*, Buffon's skua (*Lestris Buffonii*, Boie). The latter is distinguished by its more slender build and two very long tail-feathers, and it is much more common farther to the east than on Spitzbergen. I have not had an opportunity of making any observations on the mode of life of these birds.

As the skua pursues the kittiwake and the glaucous gull, it is in its turn pursued with extraordinary fierceness by the little swiftly-flying and daring bird *taernan*, the Arctic tern (*Sterna macroura*, Naum.). This beautiful bird is common everywhere on the coasts of Spitzbergen, but rather rare on Novaya Zemlya. It breeds in considerable flocks on low bare headlands or islands covered with sand or pebbles. The eggs, which are laid on the bare ground without any trace of a nest, are so like lichen-covered pebbles in colour, that it is only with difficulty they can be detected; and this is the case in a yet higher degree with the newly-hatched young, which notwithstanding their thin dress of down have to lie without anything below them among

the bare stones. From the shortness of its legs and the length of its wings it is with difficulty that the tern can get along on the ground; but this least of all the swimming birds of the Polar lands does not hesitate to attack any one, whoever he may be, that dares to approach its nest.

Along with the swimmers enumerated above, we find everywhere along these shores two species of eider, the *vanliga eidern*, common eider (*Somateria mollissima*, L.) and *praktejdern*, king-duck (*Somateria spectabilis*, L.). The former prefers to breed on



HEADS OF THE

A EIDER, B KING DUCK, C BARNACLE GOOSE, D WHITE-FRONTED GOOSE.

low islands, which, at the season for laying eggs, are surrounded by open water and are thus rendered inaccessible to the mountain foxes that wander about on the mainland. The richest eider islands I have seen in Spitzbergen are the Down Islands at Horn Sound. When I visited the place in 1858 the islands were so thickly covered with nests that it was necessary to proceed with great caution in order not to trample on eggs. The nest consists of a rich, soft, down. The best down is got by robbing the down-covered nest, an inferior kind by plucking the dead birds.

When the female is driven from the nest she seeks in haste to scrape down over the eggs in order that they may not be visible. She besides squirts over them a very stinking fluid. The eider, which some years ago was very numerous on Spitzbergen,¹ has of late years considerably diminished in numbers, and perhaps will soon be completely driven thence, if some restraint be not laid on the heedless way in which not only the Eider Islands are now plundered, but the birds too killed, often for the mere pleasure of slaughter. On Novaya Zemlya, too, the eider is common.

The king-duck occurs more sparingly than the common eider. On Spitzbergen it is called the "Greenland eider," on Greenland the "Spitzbergen eider," which appears to indicate that in neither place is it quite at home. On Novaya Zemlya, on the other hand, it occurs in larger numbers. Only once have I seen the nest of this bird, namely, in 1873 on Axel's Islands in Bell Sound, where it bred in limited numbers together with the common eider.

On the Down Islands hatches, along with the eiders, the long-necked *prutgaessen*, barnacle goose (*Anser bernicla*, L.) marked on the upper part of the body in black and brownish grey. It lays four to five white eggs in an artless nest without down, scattered here and there among the eiders' nests rich in down. This variety of goose is found in greatest numbers during the moulting season at small inland lakes along the coast, for instance on the line of coast between Bell Sound and Ice Fjord and on Gooseland.

On Spitzbergen besides the barnacle goose we meet with the closely allied species *Anser leucopsis*, Bechst. It is rather rare, but more common on Novaya Zemlya. Further there occurs at the last-named place, a third species of goose, *vildgaosen*, the "grey goose" or "great goose" of the walrus-hunters; the bean goose (*Anser segetum*, Gmel.), which is replaced on Spitzbergen by a nearly allied type, the pink-footed goose (*Anser*

¹ The quantity of eider-down which was brought from the Arctic lands to Tromsø amounted in 1868 to 540, in 1869 to 963, in 1870 to 882, in 1871 to 630, and in 1872 to 306 kilograms. The total annual yield may be estimated at probably three times as much.

brachyrhynchus, Baillon). These geese are much larger than either the eider or the barnacle goose, and appear to be sufficiently strong to defend themselves against the fox.

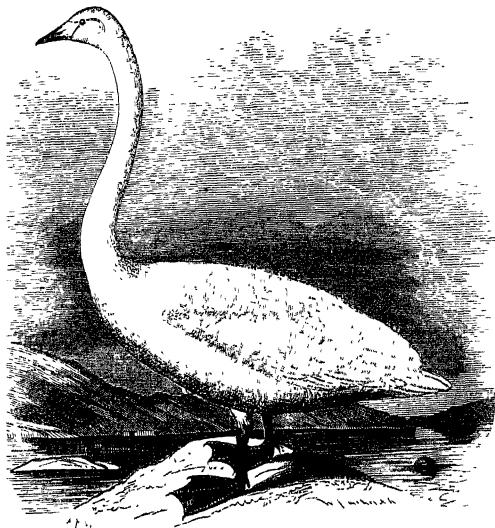
Among the swimming birds that give the summer life on Novaya Zemlya its peculiar character, we may further reckon the scaup-duck and the swan. *Alfögel* or *allan*, the long-tailed duck (*Fuligula glacialis*, L.) is rare on Spitzbergen, but occurs very generally on Novaya Zemlya, and especially in the Kara Sea, on whose coasts it is seen in summer collected in large flocks. *Mindre saongsvanen*, Bewick's swan (*Cygnus Bewickii*, Yarr.), is the most nobly formed and coloured bird of the north. I have already described its nest, which is found in considerable numbers in Gooseland. The bird is snow white, resembling the common swan, but somewhat smaller and with a considerable difference in the formation of the windpipe and the "keel" of the breastbone. The flesh is said to be coarse and of inferior flavour.

The land-birds in the Arctic regions are less numerous both in species and individuals than the sea-birds. Some of them, however, also occur in large numbers. Almost wherever one lands, some small greyish-brown waders are seen running quickly to and fro, sometimes in pairs, sometimes in flocks of ten to twenty. It is the most common wader of the north, the *fjaerplyt* of the walrus-hunters, the purple sand piper (*Tringa maritima*, Brünn.). It lives on flies, gnats, and other land insects. The purple sandpiper lays its four or five eggs in a pretty little nest of dried straw on open grassy or mossy plains a little distance from the sea.

In the company of the purple sandpiper there is often seen a somewhat larger wader, or, more correctly, a bird intermediate between the waders and the swimming birds. This is the beautiful *brednaebbade simsnaeppan*, the grey (or red) phalarope (*Phalaropus fulicarius*, Bonap.). It is not rare on Spitzbergen, and it is exceedingly common, perhaps even the commonest bird on the north coast of Asia. I imagine therefore that it is not absent from Novaya Zemlya, though there has hitherto been observed there only the nearly allied *smalnaebbade simsnaeppan*, the red-necked phalarope (*Phalaropus hyperboreus*, Lath.). This

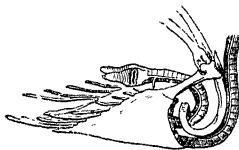
bird might be taken as the symbol of married love, so faithful are the male and female, being continually to be seen in each other's company.

During excursions in the interior of the land along the coast,



BEWICK'S SWAN.

Swedish, Mindre Saongsvanen. (*Cygnus Bewickii*, Yarr)



BREASTBONE

of *Cygnus Bewickii*, showing the peculiar position of the windpipe. After Yarell

one often hears, near heaps of stones or broken cliffs, a merry twitter. It comes from an old home-friend, the *snoesparfven* or *snoelaerkan*, the snow-bunting (*Emberiza nivalis*, L.). The name

is well chosen, for in winter this pretty bird lives as far south as the snow goes on the Scandinavian peninsula, and in summer betakes itself to the snow limit in Lapland, the *tundra* of North Siberia, or the coasts of Spitzbergen and Novaya Zemlya. It there builds its carefully-constructed nest of grass, feathers and down, deep in a stone heap, preferably surrounded by a grassy plain. The air resounds with the twitter of the gay little warbler, which makes the deeper impression because it is the only true bird's song heard in the highest north.¹

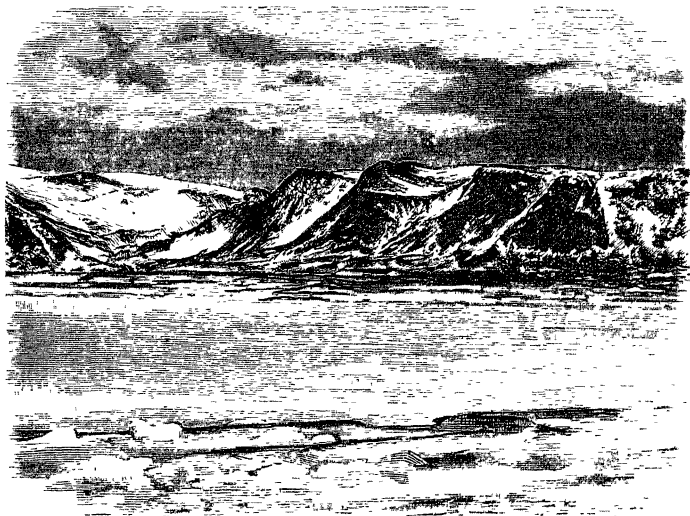
On Spitzbergen there is sometimes to be met with in the interior of the country, on the mountain slopes, a game bird, *spetsbergsripan*, the rock ptarmigan (*Lagopus hyperboreus*, Sund.). A nearly allied type occurs on the Taimur peninsula, and along the whole north coast of Asia. It perhaps therefore can scarcely be doubted that it is also to be found on Novaya Zemlya, though we have not hitherto seen it there. On Spitzbergen this bird had only been found before 1872 in single specimens, but in that year, to our glad surprise, we discovered an actual ptarmigan-fell in the neighbourhood of our winter colony, immediately south of the 80th degree of latitude. It formed the haunt of probably a thousand birds; at least a couple of hundred were shot there in the course of the winter. They probably breed there under stones in summer, and creeping in among the stones pass the winter there, at certain seasons doubtless in a kind of torpid state.

The mode of life of the Spitzbergen ptarmigan is thus widely different from that of the Scandinavian ptarmigan, and its flesh also tastes differently. For the bird is exceedingly fat, and its flesh, as regards flavour, is intermediate between blackcock and fat goose.² We may infer from this that it is a great delicacy.

¹ There are, however, various other song-birds found on South Novaya Zemlya, for instance, *Lappsparfven*, the Lapland bunting (*Emberiza lapponica*, L.), and *berglaerkan*, the shore-lark (*Alauda alpestris*, L.). They hatch on the ground under bushes, tufts of grass, or stones, in very carefully constructed nests lined with cotton-grass and feathers, and are not uncommon.

² Hedenström also states (*Otryvki o Sibiri*, St. Petersburg, 1830, p. 130,) that the ptarmigan winters on the New Siberian Islands, and that there it is fatter and more savoury than on the mainland.

When I was returning, in the autumn of 1872, from an excursion of some length along the shore of Wijde Bay, I fell in with one of our sportsmen, who had in his hand a white bird marked with black spots, which he showed me as a "very large ptarmigan." In doing so, however, he fell into a great ornithological mistake, for it was not a ptarmigan at all, but another kind of bird, similarly marked in winter, namely, *fjellugglan*,



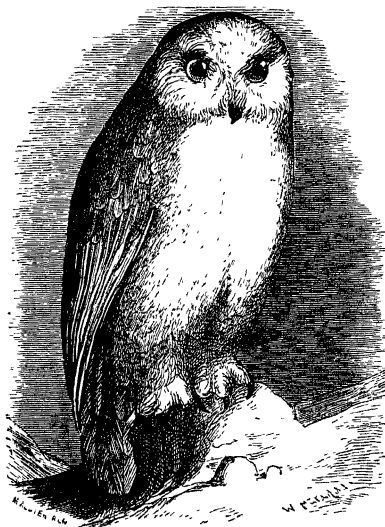
PTARMIGAN-FELL.

Mussel Bay on Spitzbergen, after a photograph taken by A. Envall on the 21st June, 1872.

the walrus-hunter's *isoern*, the snowy owl (*Strix nyctea*, L.). It evidently breeds and winters at the ptarmigan-fell, which it appears to consider as its own poultry-yard. In fact, the marking of this bird of prey is so similar to that of its victim that the latter can scarcely perhaps know how to take care of itself. On Spitzbergen the snowy owl is very rare; but on

Novaya Zemlya and the North coast of Asia—where the lemming, which is wanting on Spitzbergen, occurs in great crowds—it is common. The snow ptarmigan and the snowy owl are the only birds of which we know with certainty that they winter on Spitzbergen, and both are, according to Hedenström, native to the New Siberian Islands (*Otrywki o Sibiri*, p. 112).

In the cultivated regions of Europe the larger mammalia are so rare that most men have never seen a wild mammal so large



THE SNOWY OWL.

Swedish, Fjelluggla. (*Strix nyctea*, L.)

as a dog. This is not the case in the high north. The number of the larger mammalia here is indeed no longer so great as in the seventeenth century, when their capture yielded an abundant living to from twenty to thirty thousand men; but sport on Novaya Zemlya and Spitzbergen still supports several hundred hunters, and during summer scarcely a day passes without a

visitor to the coasts of these islands seeing a seal or a walrus, a reindeer or a Polar bear. In order to present a true picture of the Arctic traveller's surroundings and mode of life, it is absolutely necessary to give a sketch of the occurrence and mode of life of the wild mammalia in the Polar lands.

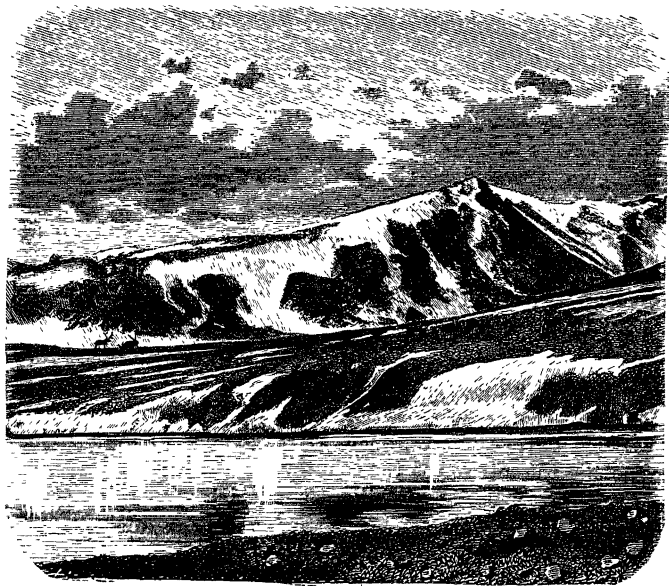
I shall begin with the reindeer. This graminivorous animal goes nearly as far to the north as the land in the old world. It was not, indeed, observed by Payer on Franz Josef Land, but traces of the reindeer were seen by us on the clay beds at Cape Chelyuskin; remnants of reindeer were observed at Barents' winter harbour on the northernmost part of Novaya Zemlya; some very fat animals were killed by Norwegian walrus-hunters on King Karl's Land east of Spitzbergen, and for some years back the reindeer was very numerous even on the north coast of North East Land, and on Castrén's, Parry's, Marten's, and Phipps' Islands, lying still farther to the north. Although these regions are situated between 80° and 81° N. L., the reindeer evidently thrives there very well. Even the Norwegian reindeer can bear the climate of Spitzbergen. It is remarkable that the reindeer, notwithstanding the devastating pursuit to which it is exposed on Spitzbergen, is found there in much larger numbers than on North Novaya Zemlya or the Taimur peninsula, where it is almost protected from the attacks of the hunter.

On Spitzbergen the reindeer have been considerably diminished in numbers by the hunting, first of the Dutch and English, and afterwards of the Russians and Norwegians. In the north-western part of the island, where the Dutch had their train-boiling establishments, the animal has been completely extirpated. It still, however, occurs on Ice Fjord in very great numbers, which, were the animal protected, would speedily increase.

That so devastating a pursuit as that which goes on year after year on Spitzbergen can be carried on without the animal being extirpated, has even given rise to the hypothesis of an immigration from Novaya Zemlya. But since I have become better acquainted with the occurrence of the reindeer in the latter place, this mode of explanation does not appear to me to be correct. If, therefore, as several circumstances in fact indicate,

an immigration of reindeer to Spitzbergen does take place, it must be from some still unknown Arctic land situated to the north-north-east.

The life of the wild reindeer is best known on Spitzbergen. During summer it betakes itself to the grassy plains in the ice-free valleys of the island, in late autumn it withdraws—



REINDEER PASTURE.

Green Harbour on Spitzbergen, after a photograph taken by A. Envall on the 20th July, 1873.

according to the walrus-hunters' statements—to the sea-coast, in order to eat the seaweed that is thrown up on the beach. In winter it goes back to the lichen-clad mountain heights in the interior of the country, where it appears to thrive exceedingly well, though the cold during winter must be excessively severe ; for when the reindeer in spring return to the coast they are

still very fat, but some weeks afterwards, when the snow has frozen on the surface, and a crust of ice makes it difficult for them to get at the mountain sides, they become so poor as to be scarcely eatable. In summer, however, they speedily eat themselves back into condition, and in autumn they are so fat that they would certainly take prizes at an exhibition of fat cattle.

The Polar bear occurs principally on coasts and islands which are surrounded by drift-ice, often even upon ice-fields far out at sea, for his best hunting is among the ice-floes. Now he is rather rare on the south-western coasts of Spitzbergen and Novaya Zemlya which are almost free of ice during summer, but more common on the northern parts of these islands, which are almost always surrounded by ice. The Polar bear is besides found everywhere along the north coast of Asia and America, apparently in greater numbers the farther north we go.

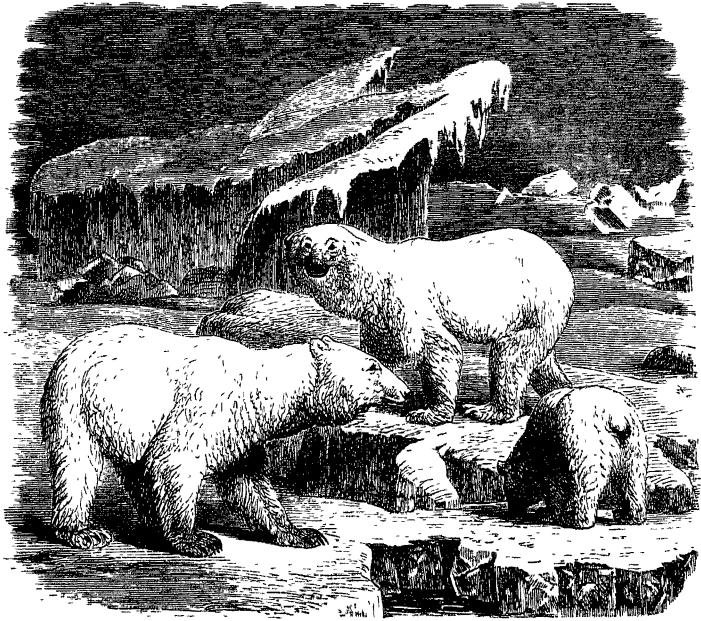
The walrus-hunting vessels from Tromsøe brought home in 1868 twenty, in 1869 fifty-three, in 1870 ninety-eight, in 1871 seventy-four, and in 1872 thirty-three bears. It may be inferred from this that the Norwegian walrus-hunters kill yearly on an average at least a hundred bears. It is remarkable that in this large number a pregnant female or one with newly-born young is never found.¹ The female bear appears to keep herself well concealed during the time she is pregnant; perhaps in some ice-hole in the interior of the country.

Whether the Polar bear hibernates during winter is not quite settled; various facts, however, point in this direction. For instance, he disappears almost completely from wintering stations during the dark time, and holes have sometimes been met with in which bears were concealed. During their extended excursions after prey the male and the female, the latter generally attended by one or two large young ones, keep each other company. Larger numbers are seldom seen together, unless at places where a good many carcasses of walruses, seals, or white fish are lying. In former times the sight of a bear created great

¹ During the wintering of 1869-70 on East Greenland, Dr. Pansch once saw a female bear with quite small young (*Die zweite deutsche Nordpolarfahrt*, Leipzig, 1873-74. Vol. II. p. 157).

dismay in Arctic travellers, but now the walrus-hunters do not hesitate a moment to attack, lance in hand, a large number of bears.

The bear's principal food consists of the seal and walrus. It is said that with a single stroke of his powerful paw he can cast



POLAR BEARS

Drawn by G. Mützel of Berlin

a walrus up on the ice. On the other hand he seldom succeeds in catching the reindeer, because it is fleeter than the bear. There is not the least doubt that, along with flesh, the bear also eats vegetable substances, as seaweed, grass, and lichens. The flesh of the bear, if he is not too old or has not recently eaten

putrid seal-flesh, is very eatable, being intermediate in taste between pork and beef. The flesh of the young bear is white and resembles veal. The eating of the liver causes sudden illness.

Along with the reindeer and the bear there are found in the regions now in question only two other land-mammalia, the mountain fox (*Vulpes lagopus* L.) and the lemming (*Myodes obensis* Brants).¹ The fox is rather common both on Spitzbergen and Novaya Zemlya. The lemming is not found on Spitzbergen, but must at certain seasons occur in incredible numbers on Novaya Zemlya. For at the commencement of summer, when the snow has recently melted away, there are to be seen, everywhere in the level fertile places in the very close grass of the meadows, footpaths about an inch and a half deep, which have been formed during winter by the trampling of these small animals, under the snow, in the bed of grass or lichens which lies immediately above the frozen ground. They have in this way united the dwellings they had excavated in the ground, and constructed for themselves convenient ways, well protected against the severe cold of winter, to their fodder-places.

In the Arctic regions proper one is not tormented by the mosquito,² and viewed as a whole the insect fauna of the entire Polar area is exceedingly scanty, although richer than was before supposed. Arachnids, acarids, and podurids occur most plentifully. Of the insects proper there were brought home from Novaya Zemlya, during the same expedition, nine species of

¹ It is stated that wolves also occur on Novaya Zemlya as far up as to Matotschkin Sound. They are exceedingly common on the north coasts of Asia and Eastern Europe.

² That is to say, not on Spitzbergen and Novaya Zemlya, for it is otherwise on the coast of the mainland. In West Greenland the mosquito as far north as the southern part of Disco Island is still so terrible, especially to the new comer during the first days, that the face of any one who without a veil ventures into marshy ground overgrown with bushes, becomes in a few hours unrecognisable. The eyelids are closed with swelling and changed into water-filled bladders, suppurating tumours are formed in the head under the hair, &c. But when a man has once undergone this unpleasant and painful inoculation, the body appears, at least for one summer, to be less susceptible to the mosquito-poison.

coleoptera, which were determined by Professor F. W. MÅKLIN, of Helsingfors. Some few hemiptera and lepidoptera and orthoptera, and a large number of hymenoptera and diptera from the same expedition have been examined by Lector A. E. HOLMGREN of Stockholm. Dr. Stuxberg also collected a large number of land-worms, which have been described by our countryman Dr. G. EISEN, now settled in California.

Of the higher animal types a greater number within the Polar territory occur in the sea than on the land. Thus by far the greater number of the birds I have enumerated above belong to the sea, not the land, and this is the case with nearly all the animals which for three or four hundred years back have been the objects of capture in the Arctic regions. This industry, which during the whale-fishing period yielded a return perhaps equal to that of the American oil-wells in our time, has not now in the most limited degree the importance it formerly had. For the animal whose capture yielded this rich return, the right whale (*Balaena mysticetus* L.), is now so nearly extirpated in these navigable waters, that the whalers were long ago compelled to seek new fishing-places in other parts of the Polar seas. It is therefore no longer the whale, but other species of animals which attract the hunter to the coasts of Spitzbergen and Novaya Zemlya.

Of these animals the most important for the last fifty years has been the walrus, but it too is in course of being extirpated. It is now seldom found during summer on the west coast of Novaya Zemlya south of Matotschkin Schar. But in the Kara Gate, on the east coast of Novaya Zemlya, and at certain places in the Kara Sea, abundant hunting is still to be had.

The largest walrus tusks I have seen were two of a male walrus purchased in the summer of 1879 at St. Lawrence Island, in the north part of Behring's Sea. They measured 32·66 and 32·47 inches in length, their largest circumference was 8·85 and 8·97 inches, and they weighed together 14½lbs. When the walrus ox gets very old, he swims about by himself as a solitary individual, but otherwise animals of the same age and sex keep



WALRUSES

After a drawing by G. von Yhlen (1861).

together in large herds. The young walrus long follows its mother, and is protected by her with evident fondness and very conspicuous maternal affection.

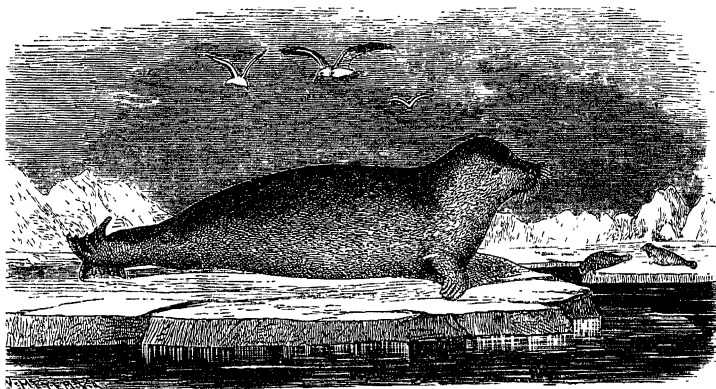
Gregariousness and curiosity appear to be the main characteristics of the walrus. These qualities of theirs I had an opportunity of observing when once, on a glorious northern summer day, I rowed forward over a mirror-bright, drift-ice-bestrewn sea right into the midst of a considerable herd of these animals. Part followed the boat long distances quite peaceably, now and then emitting a grunting sound; others swam quite close, and raised themselves high out of the water in order to take a view of the foreigners; others, again, lay so closely packed on pieces of drift-ice as to sink them down to the water's edge, while their comrades swimming about in the sea endeavoured with violence to gain a place on the already overfilled resting-places, though a number of unoccupied pieces of ice floated up and down in the neighbourhood.

The walrus is hunted for its skin, blubber, and oil. The value of a full-grown walrus was calculated at Tromsøe, in 1868, in settling accounts between the owners of hunting sloops and the hunters, at eighty Scandinavian crowns (say 4*l.* 10*s.*), but it sank in 1871 to only forty-eight crowns (say 2*l.* 15*s.*). The flesh of the walrus is coarse and train-oil-flavoured, and is eaten by the hunters only in cases of necessity. From my own experience, however, I can certify that its comparatively small tongue is very delicious. By the Eskimo and the Chukchis the flesh of the walrus is considered a delicacy.

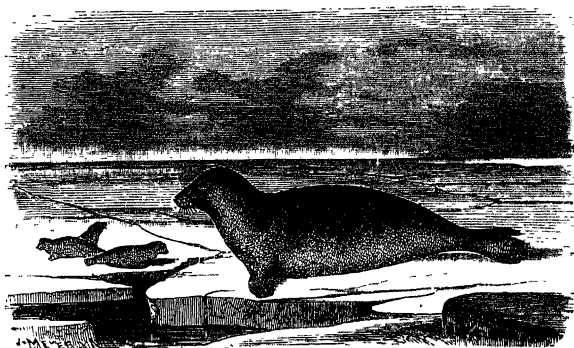
With reference to the other animals that are hunted in the Polar Sea I am compelled to be very brief, as I have scarcely any observations to make regarding them which are not already sufficiently known by numerous writings.

There are three kinds of seals on Novaya Zemlya. *Storsaelen*, the bearded seal (*Phoca barbata*, Fabr.) occurs pretty generally even on the coasts of Spitzbergen, though never in large flocks. The pursuit of this animal is the most important part of the seal-fishing in these waters, and the bearded seal is still killed yearly by thousands. Their value is reckoned in settling

accounts between owners and hunters at twenty to twenty-five Scandinavian crowns (say 22s. to 27s. 6d.).



THE BEARDED SEAL.
Swedish, Storsål. (*Phoca barbata*, Fabr.)



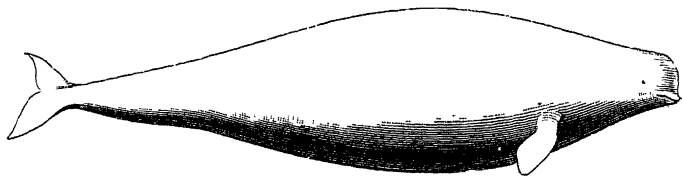
THE ROUGH SEAL.
Swedish, Snadd. (*Phoca hispida*, Erxl.)

Groenlands or *Jan-Mayen-saelen*, the Greenland seal (*Phoca Groenlandica*, Müller), which at Jan Mayen gives rise to so

profitable a fishing, is also of general occurrence among the drift-ice in the Murman and Kara seas.

Snadden, the rough or bristled seal (*Phoca hispida*, Erxl.) is also common on the coast. These animals in particular are seen to lie, each at its hole, on the ice of fjords, which has not been broken up. It also many times follows with curiosity in the wake of a vessel for long distances, and can then be easily shot; it is often so fat that, unlike the two other kinds of seals, it does not sink when it has been shot dead in the water.

Klapmytsen, the bladdernose seal (*Cystophora cristata*, Erxl.), the walrus-hunters say they have never seen on Novaya Zemlya, but it is stated to occur yearly in pretty large numbers among the ice W.S.W. of South Cape on Spitzbergen. Only once



THE WHITE WHALE. (*Delphinapterus leucas*, Pallas)

After a drawing by A. W. Quennerstedt (1864).

during our many voyages in the Polar Sea has a *Klapmyts* been seen, viz., a young one that was killed in 1858 in the neighbourhood of Bear Island.

Of the various species of whales, the narwhal, distinguished by its long and valuable horn projecting in the longitudinal direction of the body from the upper jaw, now occurs so seldom on the coast of Novaya Zemlya that it has never been seen there by the Norwegian walrus-hunters. It is more common at Hope Island, and Witsen states (p. 903) that large herds of narwhals have been seen between Spitzbergen and Novaya Zemlya.

The white whale or beluga, of equal size with the narwhal, on the other hand, occurs in large shoals on the coasts of Spitzbergen and Novaya Zemlya, especially near the mouths of fresh-water streams.

There were taken in the year 1871, when the fishing appears to have been most productive, by vessels belonging to Tromsøe alone, 2,167 white whales. Their value was estimated at fifty-four Scandinavian crowns each (about 3*l.*). With its glistening white hide, on which it is seldom possible to discover a spot, wrinkle, or scratch, the full-grown white whale is an animal of extraordinary beauty. The young whales are not white, but very light greyish brown. Other species of the whale occur seldom on Novaya Zemlya.

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CHAPTER IV.

Yugor Schar and Kara Sea—"The Highest Mountain" on Earth—Anchorages—Entering the Kara Sea—Its Surroundings—The Inland-Ice of Novaya Zemlya—True Icebergs rare in certain parts of the Polar Sea—The Natural Conditions of the Kara Sea—Animals—Plants—Passage across the Kara Sea—The Influence of the Ice on the Sea-bottom—Fresh-water Diatoms on Sea-Ice—Arrival at Port Dickson—Animal Life there—Settlers and Settlements at the mouth of the Yenisei—The Flora at Port Dickson—Invertebrates—Excursion to White Island—Yalmal—Previous Visits—Nummelin's Wintering on the Briochov Islands.

IN crossing to Vaygats Island I met the *Lena*, which then first appeared at the rendezvous that had been fixed upon. I gave the captain orders to anchor without delay, to coal from the *Express*, and to be prepared immediately after my return from the excursion to weigh anchor and start along with the other vessels. I came on board the *Vega* on the evening of the 31st July, much pleased and gratified with what I had seen and collected in the course of my excursion on Vaygats Island. The *Lena*, however, was not quite ready, and so the start was put off till the morning of the 1st August. All the vessels then weighed anchor, and sailed or steamed through Vaygats Sound or Yugor Schar into the Kara Sea. We do not meet with the name Yugor Schar in the oldest narratives of travel or on the oldest maps. The first Dutch north-east explorers called it Vaygats Sound or Fretum Nassovicum. More recent geographers call it also Pet's Strait, which is incorrect, as Pet did not sail through it. I shall in the following part of this work comprehend under

the name "Kara Sea" the whole of that gulf which from 77° N.L. between Cape Chelyuskin and the northern extremity of Novaya Zemlya extends southwards to the north coast of Europe and Asia.

Most of the vessels that wish to sail into the Kara Sea through Yugor Schar require to anchor here some days to wait for favourable winds and state of the ice. There are no good harbours in the neighbourhood of the sound, but available anchorages occur, some in the bay at Chabarova, at the western entrance of the sound; some, according to the old Dutch maps, on the eastern side of the sound, between Mestni Island (Staten Eiland) and the mainland. I have, however, no experience of my own of the latter anchorages, nor have I heard that the Norwegian walrus-hunters have anchored there. Perhaps by this time they have become too shallow.

When we sailed through Yugor Schar in 1878, the sound was completely free of ice. The weather was glorious, but the wind was so light that the sails did little service. In consequence of this we did not go very rapidly forward, especially as I wished to keep the three vessels together, and the sailing ship *Express*, not to be left behind, had to be towed by the *Fraser*. Time was lost besides in dredging and taking specimens of water. The dredgings gave at some places, for instance off Chabarova, a rich yield, especially of isopods and sponges. The samples of water showed that at a limited depth from the surface it had a considerable salinity, and that therefore no notable portion of the mass of fresh water, which the rivers Kara, Obi, Tas, Yenisei and others pour into the Kara Sea, flows through this sound into the Atlantic Ocean.

In the afternoon of the 1st August we passed through the sound and steamed into the sea lying to the east of it, which had been the object of so many speculations, expectations, and conclusions of so many cautious governments, merchants eager for gain, and learned cosmographers, from the sixteenth and seventeenth centuries, and which even to the geographer and man of science of the present has been a *mare incognitum* down to the most recent date. It is just this sea that formed the

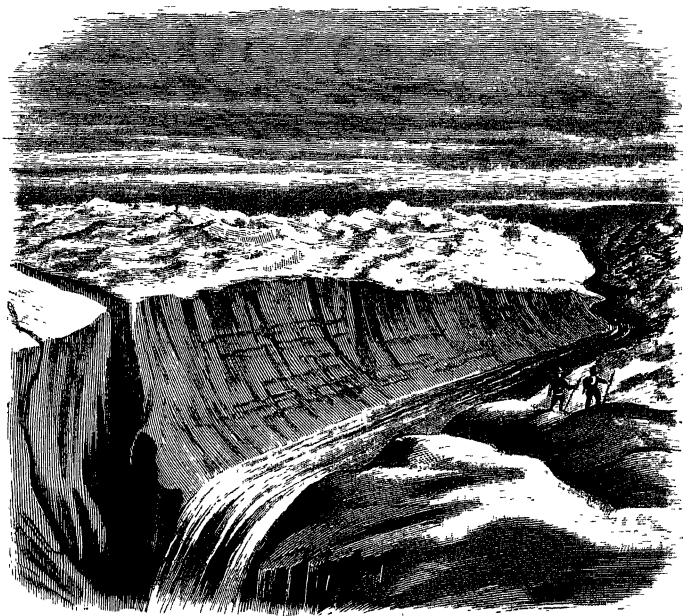
turning-point of all previous north-east voyages, from Burrough's to Wood's and Vlamingh's, and it may therefore not be out of place here, before I proceed further with the sketch of our journey, to give some account of its surroundings and hydrography.

Leaving out of view the little new-discovered island, "Ensamheten," the Kara Sea is open to the north-east. It is bounded on the west by Novaya Zemlya and Vaygats Island; on the east by the Taimur peninsula, the land between the Pyaesina and the Yenisei and Yalmal; and on the south by the northernmost portion of European Russia, Beli Ostrov, and the large estuaries of the Obi and the Yenisei. The coast between Cape Chelyuskin and the Yenisei consists of low rocky heights, formed of crystalline schists, gneiss, and eruptive rocks, from the Yenisei to beyond the most southerly part of the Kara Sea, of the Gyda and Yalmal *tundras*, beds of sand of equal fineness, and at Vaygats Island and the southern part of Novaya Zemlya (to 73° N.L.) of limestone and beds of schist¹ which slope towards the sea with a steep escarpment ten to forty-eight feet high, but form, besides, the substratum of a level plain, full of small collections of water which is quite free of snow in summer. North of 73° again the west coast of the Kara Sea is occupied by mountains, which near Matotschkin are very high, and distributed in a confused mass of isolated peaks, but farther north become lower and take the form of a plateau.

Where the mountains begin, some few or only very inconsiderable collections of ice are to be seen, and the very mountain tops are in summer free of snow. Farther north glaciers commence, which increase towards the north in number and size, till they finally form a continuous inland-ice which, like those of Greenland and Spitzbergen, with its enormous ice-sheet, levels mountains and valleys, and converts the interior of the land into a wilderness of ice, forming one of the fields for the formation of icebergs or

¹ I come to this conclusion from the appearance of the strata as seen from the sea, and from their nature on Vaygats Island and the west coast of Novaya Zemlya. So far as I know, no geologist has landed on this part of the east coast.

glacier ice-blocks, which play so great a part in sketches of voyages in the Polar seas. I have not myself visited the inland-ice on the northern part of Novaya Zemlya, but doubtless the experience I have previously gained during an excursion with Dr. Berggren on the inland-ice of Greenland in the month of



VIEW FROM THE INLAND-ICE OF GREENLAND.

After a drawing by S. Berggren, 23rd July, 1870.

July 1870, *after all the snow on it had melted*, and with Captain Palander on the inland-ice of North-East Land in the beginning of June 1873, *before any melting of snow had commenced*, is also applicable to the ice-wilderness of north Novaya Zemlya.

As on Spitzbergen, the ice-field here is doubtless interrupted

by deep bottomless clefts, over which the snowstorms of winter throw fragile snow-bridges, concealing the openings of the abysses so completely that one may stand close to their edge without having any suspicion that a step further is certain death to the man, who, without observing the usual precaution of being bound by a rope to his companions, seeks his way over the blinding-white, almost velvet-like, surface of this snow-field, hard packed indeed, but bound together by no firm crust. If a



* GLACIER WITH STATIONARY FRONT,
Udde Bay, on Novaya Zemlya, after a drawing by Hj. Thélal (1875)

man, after taking necessary precautions against the danger of tumbling into these crevasses, betakes himself farther into the country in the hope that the apparently even surface of the snow will allow of long day's marches, he is soon disappointed in his expectations; for he comes to regions where the ice is everywhere crossed by narrow depressions, *canals*, bounded by dangerous clefts, with perpendicular walls fifty feet in height.

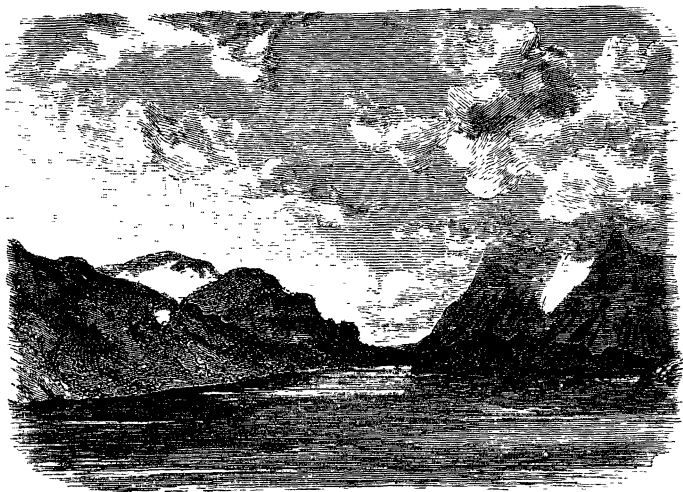
After the melting of the snow there appears besides a number of inequalities, and the clefts previously covered with a fragile

snow-bridge, now gape before the wanderer as he advances with their bluish-black abysses, bottomless as far as we can depend on ocular evidence. At some places there are also to be found in the ice extensive shallow depressions, down whose sides innumerable rapid streams flow in beds of azure-blue ice, often of such a volume of water as to form actual rivers. They generally debouch in a lake situated in the middle of the depression. The lake has usually an underground outlet through a grotto-vault of ice several thousands of feet high. At other places a river is to be seen, which has bored itself a hole through the ice-sheet, down which it suddenly disappears with a din which is heard far and wide, and at a little distance from it there is projected from the ice a column of water, which, like a geyser with a large intermittent jet in which the water is mixed with air, rises to a great height.

The inland-ice on Novaya Zemlya is of too inconsiderable extent to allow of any large icebergs being formed. There are none accordingly in the Kara Sea, and it is seldom that even a large glacier ice-block is to be met with drifting about.¹

¹ In most of the literary narratives of Polar journeys, colossal icebergs play a very prominent part in the authors' delineations both with the pencil and the pen. The actual fact, however, is that icebergs occur in far greater numbers in the seas which are yearly accessible than in those in which the advance of the Arctic explorer's vessel is hindered by impenetrable masses of ice. If we may borrow a term from the geography of plants to indicate the distribution of icebergs, they may be said to be more *boreal* than *polar* forms of ice. All the fishers on the coast of Newfoundland, and most of the captains on the steamers between New York and Liverpool, have some time or other seen true icebergs, but to most north-east voyagers this formation is unknown, though the name iceberg is often in their narratives given to glacier ice-blocks of somewhat considerable dimensions. This, however, takes place on the same ground and with the same justification as that on which the dwellers on the Pechora consider Bolshoi-Kamen a very high mountain. But although no true icebergs are ever formed at the glaciers so common on Spitzbergen and also on north Novaya Zemlya, it however often happens that large blocks of ice fall down from them and give rise to a swell, which may be very dangerous to vessels in their neighbourhood. Thus a wave caused by the falling of a piece of ice from a glacier on the 23rd (13th) of June, 1619, broke the masts of a vessel anchored at Bell Sound on Spitzbergen, threw a cannon overboard, killed three men, and wounded many more (Purchas, iii. p. 734). Several similar adventures, if on a smaller scale, I could relate from my own experience and that of the walrus-hunters. Care is taken on this account to avoid anchoring too near the perpendicular faces of glaciers.

In general our knowledge of the Kara Sea some decades back was not only incomplete, but also erroneous. It was believed that its animal life was exceedingly scanty, and that algæ were absolutely wanting; no soundings had been taken elsewhere than close to the coast; and much doubt was thrown, not without reason, on the correctness of the maps. Now all this is changed to a great extent. The coast line, bordering on the sea, is settled

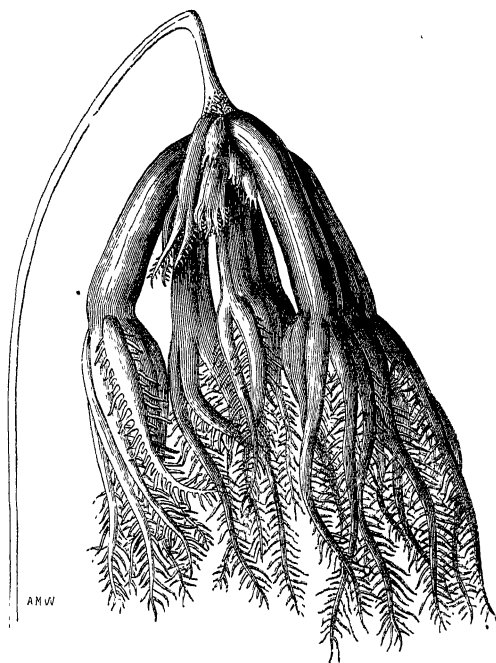


VIEW FROM MATOTSCHKIN SCHAR.
(After a drawing by HJ Théel. 1875.)

on the maps; the ice conditions, currents and depth of water in different parts of the sea are ascertained, and we know that the old ideas of its poverty in animals and plants are quite erroneous.

In respect to depth the Kara Sea is distinguished by a special regularity, and by the absence of sudden changes. Along the east coast of Novaya Zemlya and Vaygats Island there runs a channel, reaching 1,640 feet in depth, filled with cold salt-water, which forms the haunt of a fauna rich not only in individuals, but

also in a large number of remarkable and rare types, as *Umbellula*, *Elpidia*, *Alecto*, asterids of many kinds, &c. Towards the east the sea-bottom rises gradually and then forms a plain lying 100 to 300 feet below the surface of the sea, nearly as level as the surface of the superincumbent water. The bottom of the sea



UMBELLULA FROM THE KARA SEA.

Polype stem, upper part, one and a half times the natural size.

in the south and west parts of it consists of clay, in the regions of *Beli Ostrov* of sand, farther north of gravel. Shells of crustacea and pebbles are here often surrounded by bog-ore formations. These also occur over an extensive area north-east of *Port Dickson* in such quantity that they might be used for the manufacture of iron, if the region were less inaccessible.

I shall now return to the account of our passage across this sea. On this subject my journal contains the following notes :

August 3rd. In the morning Captain Johannesen came on board the *Vega*. I gave him orders to take on board Dr. Almquist and Lieutenants Hovgaard and Nordquist, and go with them to Beli Ostrov, where they should have freedom for thirty-six hours to study the people, animals, and plants, as they pleased ; the *Lena* was then, if possible, to pass through the sound between the island and Yalmal to Port Dickson, where the three other vessels should be found. Almquist, Nordquist, and Hovgaard were already quite ready for the excursion ; they went immediately on board the *Lena*, and were soon, thanks to the great power of the engine in proportion to the size of the vessel, far on their way.

In the course of the day we met with very open and rotten ice, which would only have been of use to us by its moderating effect on the sea, if it had not been accompanied by the usual attendant of the border of the ice, a thick fog, which however sometimes lightened. Towards evening we came in sight of Beli Ostrov. This island, as seen from the sea, forms a quite level plain, which rises little above the surface of the water. The sea off the island is of an even depth, but so shallow, that at a distance of twelve to eighteen miles from the shore there is only from twenty-three to thirty feet of water. According to a communication from Captain Schwanenberg, there is, however, a depth of ten to thirteen feet close to the north shore. Such a state of things, that is, a uniform depth, amounting near the shore to from thirteen to thirty-two feet, but afterwards increasing only gradually and remaining unchanged over very extensive areas, is very common in the Arctic regions, and is caused by the action of the ice on the mud which goes on there nearly all the year round. Another remarkable effect of the action of the ice is that all the blocks of stone to be found in the sea next the beach are forced up on land. The beach itself is formed accordingly at many places, for instance at several points in Matotschkin Sound, of a nearly continuous stone rampart going to the sea-level, while in front of it there is a quite even sea-bottom without a fragment of stone.

August 4th. In the morning a gentle heaving indicated that the sea was again free of ice, at least over a considerable space to windward. Yesterday the salinity in the water was already diminished and the amount of clay increased; now the water, after being filtered, is almost drinkable. It has assumed a yellowish-grey colour and is nearly opaque, so that the vessel appears to sail in clay mud. We are evidently in the area of the Ob-Yenisei current. The ice we sailed through yesterday probably came from the Gulf of Obi, Yenisei or Pyaesina. Its



SECTION FROM THE SOUTH COAST OF MATOTSCHKIN SOUND,
Showing the origin of Stone-ramparts at the beach.

surface was dirty, not clean and white like the surface of glacier-ice or the sea-ice that has never come in contact with land or with muddy river-water. Off the large rivers the ice, when the snow has melted, is generally covered with a yellow layer of clay. This clay evidently consists of mud, which has been washed down by the river-water and been afterwards thrown up by the swell on the snow-covered ice. The layer of snow acts as a filter and separates the mud from the water. The former, therefore, after the melting of the snow may form upon true sea-ice a layer of

dirt, containing a large number of minute organisms which live only in fresh water.

August 5th. Still under sail in the Kara Sea, in which a few pieces of ice are floating about. The ice completely disappeared when we came north-west of Beli Ostrov. We were several times in the course of the day in only twenty-nine feet of water, which, however, in consequence of the evenness of the bottom, is not dangerous. Fog, a heavy sea, and an intermittent but pretty fresh breeze delayed our progress.

August 6th. At three o'clock in the morning we had land in sight. In the fog we had gone a little way up the Gulf of Yenisei, and so had to turn in order to reach our destination, Port Dickson. The mast-tops of the *Express* were seen projecting over islands to the north, and both vessels soon anchored south of an island which was supposed to be Dickson's Island, but when the *Fraser* soon after joined us we learned that this was a mistake. The shore, which, seen from our first anchorage, appeared to be that of the mainland, belonged in fact to the pretty extensive island, off which the haven itself is situated.

After an excursion on land, in the course of which a covey of partridges was seen, and Dr. Kjellman on the diorite rocks of the island made a pretty abundant collection of plants, belonging partly to species which he had not before met with in the Arctic regions, we again weighed anchor in order to remove to the proper harbour.

Captain Palander went before in the steam launch in order to examine the yet unsurveyed fairway. On the way he fell in with and killed a bear, an exceedingly fat and large male. Like the bear Dr. Théel shot here in 1875, he had only mosses and lichens in his stomach, and as it is scarcely probable that the bear in this region can catch a great many seals in summer, it is to be supposed that his food consists principally of vegetable substances, with the addition perhaps of a reindeer or two when he can succeed in getting hold of them. In the year 1875 we saw here an old male bear that appeared to pasture quite peaceably in company with some reindeer, probably with a view to get near enough to spring upon them. Bears must besides be very common

in that part of the north coast of Siberia, for during the few days we now remained there, two more were shot, both of them very fat.

The haven, which has now been surveyed by Lieutenant Bove, was discovered by me in 1875 and named Port Dickson. It is the best known haven on the whole north coast of Asia, and will certainly in the future be of great importance for the foreign commerce of Siberia. It is surrounded on all sides by rocky islands, and is thus completely sheltered. The anchorage is a good clay bottom. The haven may be entered both from the north and from the south-west; but in sailing in caution should be used, because some rocky shoals may be met with which are not shown on Lieutenant Bove's sketch chart, which was made in the greatest haste.

At our arrival six wild reindeer were seen pasturing on Dickson's Island; one of them was killed by Palander, the others were stalked unsuccessfully. Some bears, as has already been stated, were also seen, and everywhere among the heaps of stones there were numerous remains of the lemming and the fox. With these exceptions there were few of the higher animals. Of birds we thus saw only snow-buntings, which bred among the stone heaps both on the mainland and on the islands, a covey of ptarmigan, a large number of birds, principally species of *Tringa* and *Phalaropus*, but not further determined, eiders, black guillemots and burgomasters in limited numbers, and long-tailed ducks and loons in somewhat greater abundance. There are no "down islands," and as there are no precipitous shore cliffs neither are there any loomerics. A shoal of fish was seen in Lena Sound, and fish are probably exceedingly abundant. Seals and white whales also perhaps occur here at certain seasons of the year in no small numbers.

I am convinced that the day will come when great warehouses and many dwellings inhabited all the year round will be found at Port Dickson. Now the region is entirely uninhabited as far as Goltchicha, although in the middle of last century numerous dwelling-houses were to be found built along the river bank and sea-shore beyond the mouth of the Yenisei and as far as to the Pyaesina.

The *simovies* at the mouth of the Yenisei formed in their time the most northerly fixed dwelling-places of the European races.¹ Situated as they were at the foot of the cold *tundra*, exposed to continual snowstorms in winter and to close fogs during the greater part of summer, which here is extremely short, it seems as if they could not offer their inhabitants many opportunities for enjoyment, and the reason why this tract was chosen for a



RUINS OF A SIMOVIE AT KRESTOVSKOI.

After a drawing by A. Stuxberg.

residence, especially in a country so rich in fertile soil as Siberia, appears to be difficult to find. The remains of an old *simovie* (Krestovskoi), which I saw in 1875 while travelling up the river along with Dr. Lundström and Dr. Stuxberg, however, produced the impression that a true home life had once been led there.

¹ The most northerly fixed dwelling-place, which is at present inhabited by Europeans, is the Danish commercial post Tasiusak, in north-western Greenland, situated in 73° 24' N.L.

Three houses with turf-covered roofs then still remained in such a state that one could form an idea of their former arrangement and of the life which had been carried on in them. Each cabin contained a whole labyrinth of very small rooms; dwelling-rooms with sleeping-places fixed to the walls, bake-rooms with immense fireplaces, bathing houses with furnaces for vapour-baths, store-houses for train-oil, with large train-drenched blubber troughs hollowed out of enormous tree-stems, blubber tanks with remains of the white whale, &c., all witnessing that the place had had a flourishing period, when prosperity was found there, when the home was regarded with loyalty, and formed in all its loneliness the central point of a life richer perhaps in peace and well-being than one is inclined beforehand to suppose.

A little farther south, but still far north of the limit of trees, there are, however, very well-to-do peasants, who inhabit large *simovies*, consisting of a great number of houses and rooms, in which a certain luxury prevails, where one walks on floor-coverings of skins, where the windows are whole, the holy pictures covered with plates of gold and silver, and the walls provided with mirrors and covered with finely coloured copper-plate portraits of Russian Czars and generals. This prosperity is acquired by traffic with the natives, who wander about as nomads on the *tundra* with their reindeer herds.

The cliffs around Port Dickson consist of diorite, hard and difficult to break in pieces, but weathering readily. The rocky hills are therefore so generally split up that they form enormous stone mounds. They were covered with a great abundance of lichens, and the plains between them yielded to Dr. Kjellman many phanerogamous plants. On the other hand no large algæ were met with in the sea, nor was it to be expected that there would be, for the samples of water taken up with Ekman's instrument showed that the salinity at the bottom was as slight as at the surface, viz., only 0.3 per cent. The temperature of the water was also at the time of our visit about the same at the bottom as at the surface, viz., $+ 9^{\circ}$ to $+ 10^{\circ}$ Centigrade. In spring, when the snow melts, the water here is probably quite fresh, in winter again cold, and as salt as at the bottom of the

Kara Sea. Under so variable hydrographical conditions we might have expected an exceedingly scanty marine fauna, but this was by no means the case. For the dredgings in the harbour

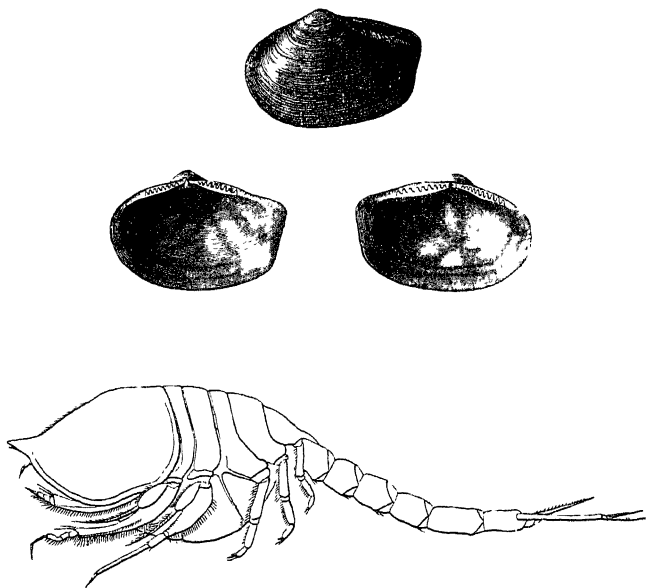


SIEVERSIA GLACIALIS, R. BR.

From Port Dickson.

gave Dr. Stuxberg a not inconsiderable yield, consisting of the same types as those which are found in the salt water at the bottom of the Kara Sea.

Driftwood in the form both of small branches and pieces of roots, and of whole trees with adhering portions of branches and roots, occurs in such quantities at the bottom of two well-protected coves at Port Dickson, that the seafarer may without difficulty provide himself with the necessary stock of fuel. The



VERTEBRATES FROM PORT DICKSON.

- A. *Yoldia arctica* GRAY. One and two-thirds of natural size. B. *Diastylis Rathkei* KN.
Magnified three times.

great mass of the driftwood which the river bears along, however, does not remain on its own banks, but floats out to sea to drift about with the marine currents until the wood has absorbed so much water that it sinks, or until it is thrown up on the shores of Novaya Zemlya, the north coast of Asia, Spitzbergen, or perhaps Greenland. Another portion of the wood

sinks, before it reaches the sea, often in such a way that the stems stand upright in the river bottom, with one end, so to say, rooted in the sand. They may thus be inconvenient for the navigation, at least at the shallower places of the river. A bay immediately off Port Dickson was almost barred by a natural palisade-work of driftwood stems.

August 7th. The *Vega* coaled from the *Express*. In the evening the *Lena* arrived, 36 hours after the *Vega* had anchored, that is to say, precisely at the appointed time. Concerning this excursion Dr. Almquist reports :

“Beli Ostrov consists entirely of fine sand, and only on that part of the beach which is washed by the sea-water did we see any stones as large as walnuts ; higher up we did not find a piece of stone even of the size of the nail. The highest point of the island appears to be scarcely ten feet above the surface of the sea. That part of the island over which the sea-water washes, that is, the beach and the deep bays which indent the land here and there, shows the fine sand bare, without trace of vegetation. Where the ground rises a little, it becomes covered with a black and white variegated covering of mosses and lichens ; scattered among which at long intervals are small tufts of grass. First somewhat higher up, and properly only round the marshy margins of the numerous small fresh-water lakes and in hollows and bogs, is the ground slightly green. The higher plants are represented by only 17 species, all small and stunted, most of them rising only some few lines above the sand. Very few plants reached a height of 6 inches. No kind of willow was found, nor any flower seen of any other colour than green or white.

“The lichen-flora too was scanty. About 80 species were found. The land invertebrates were so sparingly represented, that only three Diptera, one species of Hymenoptera, and some insect larvæ and spiders could be collected. Only poduræ were found in great abundance ; they completely covered the whole ground at the beach. Several herds of reindeer were seen, but we did not succeed in getting within range of them. Rain and fog rendered impossible any determination of position. During night we went across the sound and anchored about an English mile and a half from the shore of Yalmal.

“So far as we may judge from our hasty visit, the vegetation on this part of Yalmal struck us as being remarkably abundant.

The high banks especially were richly covered by phanerogamous plants and lichens, and would have deserved a closer examination. Our cursory observations of the plants here may however be interesting for comparison with the flora of Beli Ostrov; we collected and noted the higher plants and about 40 species of lichens. Nordquist found that the fauna resembled that of the neighbouring island, and collected besides two species of Coleoptera."

Yalmal's grassy plains offer the Samoyeds during summer reindeer pastures which are highly valued, and the land is said to have a very numerous population in comparison with other regions along the shores of the Polar Sea, the greater portion, however, drawing southward towards winter with their large herds of reindeer. But the land is, notwithstanding this, among the most imperfectly known parts of the great Russian empire.

During the Swedish expedition of 1875 we landed about the middle of the west coast of Yalmal. In order to give an idea of the nature of the country, I make the following extract from my narrative of the voyage,¹ which has had but a limited circulation :

• "In the afternoon of the 8th August I landed, along with Lundström and Stuxberg, on a headland projecting a little from Yalmal on the north side of the mouth of a pretty large river. The landing place was situated in lat. 72° 18', long. 68° 42'. The land was bounded here by a low beach, from which, at a distance of one hundred paces, a steep bank rose to a height of from 20 to 100 feet. Beyond this bank there is an extensive, slightly undulating plain, covered with a vegetation which indeed was exceedingly monotonous, but much more luxuriant than that of Vaygats Island or Novaya Zemlya. The uniformity of the vegetation is perhaps caused, in a considerable degree, by the uniform nature of the terrain. There is no solid rock here. The ground everywhere consists of sand and sandy clay, in which I could not find a stone so large as a bullet or even as a pea, though I searched for a distance of several miles along the shore.

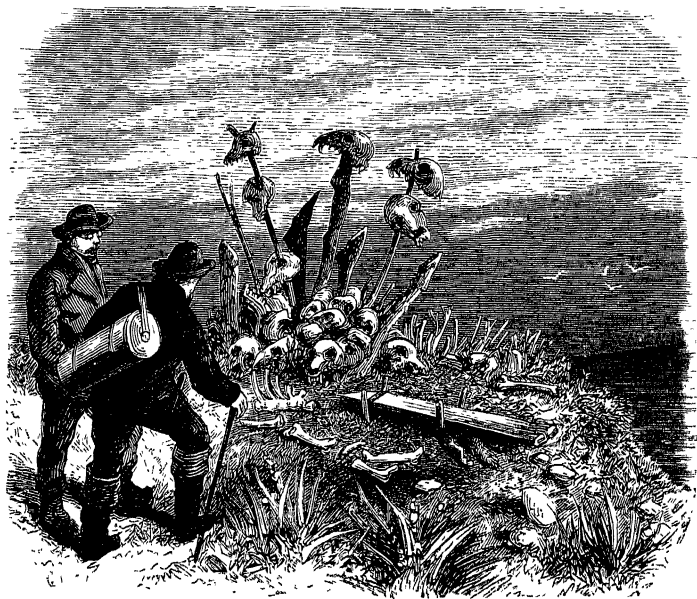
¹ Nordenskiöld *Redogörelse för en expedition till mynningen af Jenisej och Sibirien år 1875*, Bih. till Kongl. Vet.-Ak. Handl. vol. iv. No. 1, pp. 38-42.

Nor did the dredge bring up any stones from the sea-bottom off the coast, a circumstance which, among other things, is remarkable, because it appears to show that the strand-ice from the Obi and Yenisei does not drift down to and melt in this part of the Kara Sea. Nor do the sand beds contain any sub-fossil shells, as is the case with the sand beds of the Yenisei *tundra*. 'Noah's wood' also appears to be absent here. To judge from our observations at this place, the peninsula between the Gulf of Obi and the Kara Sea thus differs very essentially from the *tundra* lying east of the Yenisei.

"We saw no inhabitants, but everywhere along the beach numerous traces of men—some of them barefoot—of reindeer, dogs and Samoyed sleighs, were visible. On the top of the coast-bank was found a place of sacrifice, consisting of forty-five bears' skulls of various ages placed in a heap, a large number of reindeer skulls, the lower jaw of a walrus, &c. From most of the bears' skulls the canine teeth were broken out, and the lower jaw was frequently entirely wanting. Some of the bones were overgrown with moss, and lay sunk in the earth; others had, as the adhering flesh showed, been placed there during the present year. In the middle of the heap of bones stood four erect pieces of wood. Two consisted of sticks a yard in length with notches cut in them, serving to bear up the reindeer and bears' skulls, which were partly placed on the points of the sticks or hung up by means of the notches, or spitted on the sticks by four-cornered holes cut in the skulls. The two others, which clearly were the proper idols of this place of sacrifice, consisted of driftwood roots, on which some carvings had been made to distinguish the eyes, mouth, and nose. The parts of the pieces of wood, intended to represent the eyes and mouth, had recently been besmeared with blood, and there still lay at the heap of bones the entrails of a newly-killed reindeer. Close beside were found the remains of a fireplace, and of a midden, consisting of reindeer bones of various kinds and the lower jaws of bears.

"As the sandy slopes of the beach offered no suitable breeding-place for looms, black guillemots, or other sea-fowl, and there were no islands along the coast which could serve as breeding-

places for eiders and other species of geese which breed in colonies, the abundant bird-life of the Polar Sea was wanting here. At the mouth of the river, however, large flocks of eiders and long-tailed ducks flew about, and on the sandy banks along the shore, flocks of *Calidris arenaria* and a *Tringa* or two ran



PLACE OF SACRIFICE ON YALMAI.
After a drawing by A. N. Lundstrom.

about restlessly seeking their food. The solitude of the *tundra* was broken only by a couple of larks and a pair of falcons (*Falco peregrinus*) with young. Traces of reindeer were also seen, and two fox-traps set on the strand-banks showed that foxes occur in these regions in sufficient numbers to be the object of capture.

"Later in the afternoon, when some solar altitudes had been taken, in order to determine the geographical position of the place, we rowed back to our vessel and sailed on, keeping at some distance from the coast, and at one place passing between the shore and a long series of blocks of ground-ice which had stranded along the coast in a depth of nine to sixteen metres. During night we passed a place where five Samoyed tents were pitched, in whose neighbourhood a large number of reindeer pastured. The land was now quite low, and the sea had become considerably shallower. The course was therefore shaped for the N.W., in which direction deeper water was soon met with. Notwithstanding the slight salinity and high temperature ($+ 7^{\circ}7$) of the surface-water, a *Clio borealis* and a large number of Copepoda were taken at the surface."

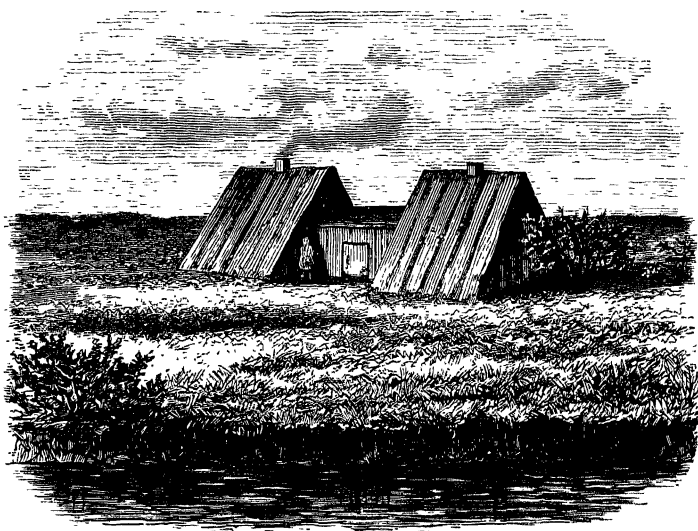
A very promising yet untouched field for researches in ethnography and natural history here lies before future travellers to the Yenisei.

What sort of winter is there at the mouth of the Yenisei? We have for the present no information on this point, as no scientific man has wintered there. But on the other hand we have a very exciting narrative of the wintering of the Fin, NUMMELIN, at the Briochov Islands in the Yenisei in lat. $70^{\circ} 48'$ north.

I visited the place on the 27th August, 1875. It consisted of a fishing post, occupied only in summer, and at that season of the year very attractive, surrounded as it is by luxuriant vegetation of grass and bushes. The houses were situated on a sound running between the Briochov Islands, which form the northernmost group of the labyrinth of islands which occupy the channel of the Yenisei between $69\frac{1}{2}^{\circ}$ and 71° N.L. At the time of our visit the fishing was over for the season and the place deserted. But two small houses and a number of earth-huts (*jordgammor*), all in good repair, stood on the river-bank, and gave evidence, along with a number of large boats drawn up on land, and wooden vessels intended for salting fish, of the industry which had been carried on there earlier in the summer.

It was at this place that Nummelin passed one of the severest winters that Arctic literature has to record.¹

In 1876 M. Sidoroff, well known for the lively interest which he takes in navigation in the Siberian waters, had a ship *Severnœ Sianie* (the *Aurora*) built and fitted out at Yeniseisk, in order to carry goods from the Yenisei to Europe. The vessel was placed



“JORDGAMMOR” ON THE BRIOCHOV ISLANDS.

After a sketch by the Author.

under the command of a Russian sea-captain, Schwanenberg. Under him Nummelin served as mate, and the vessel had a

¹ I give the particulars of this wintering, partly after communications made to me in conversation by Nummelin, partly after *Göteborgs Handelsoch Sjöfartstidning* for the 20th and 21st November, 1877. This *first* and, as far as I know, only detailed narrative of the voyage in question, was dictated to the editor of that journal, *reference being made to the log* by Schwanenberg and Nummelin. Schwanenberg had come to Gothenburg some days before with his Yeniseisk-built vessel.

crew of eighteen men, most of whom had been exiled to Siberia for crime. In consequence of various mishaps the vessel could not get farther the first year than to the neighbourhood of the mouth of the Yenisei, where it was left in winter quarters at the place which has been named above. Nummelin and four exiles remained on board, while Schwanenberg and the rest of the crew returned to Yeniseisk on the 28th September. Frost had already commenced. During the two following weeks the temperature kept about the freezing point; clear weather alternating with snow and rain.

On the 5th of October the crew withdrew to their winter quarters, having previously collected driftwood and placed it in heaps in order that they might easily find it under the snow.

On the 16th October the thermometer at eight o'clock in the morning showed $-4^{\circ}5$ C. and afterwards sank lower every day, until after the 21st October the mercury for some days was constantly under -10° . On the 26th October the temperature was -18° , but in the beginning of November it rose again to -2° . On the 6th November it sank again to -17° , but rose on the 11th to $-3^{\circ}5$. On the 14th November the thermometer showed $-23^{\circ}5$, on the 21st $-29^{\circ}5$. Next day in the morning it stood at -32° , and in the evening at -37° , but these figures were arrived at *by guess*, the instrument not indicating so low temperatures. This temperature of -30° to -32° , varying with frozen mercury, continued till the end of November, when it rose again to $-11^{\circ}5$. At Christmas there was again a temperature of -31° , and the six following days the mercury was frozen, with which the new year came in. The temperature then rose again to -20° , but soon sank so that from the 16th January the mercury was frozen for five days. On the 22nd January the reading was -9° . On the 26th the mercury froze again, and on the 29th the temperature was -6° . During the month of February the temperature never rose above -24° ; the mercury was frozen on the 20th, 25th, 26th, and 28th. This was the case on the 1st, 3rd, 6th, 7th, 14th, 16th, and 18th March; on the 22nd March the reading was -7° , on the 30th -29° . April began with -31° , but the temperature afterwards rose, so that on the 16th

it reached -11° , and varied between -21° and -6° (the 25th). On the 2nd May the reading in the morning and evening was -12° , at mid-day -2° to -5° . On the 8th May it was $+0$, on the 17th $-10^{\circ}5$, on the 31st $+0^{\circ}5$. June began with $+1^{\circ}5$. On the 8th the reading at mid-day was $+11^{\circ}$, on the morning and evening of the same day $+2^{\circ}$ to $+3^{\circ}$. During the remainder of June and the month of July the temperature varied between $+2^{\circ}$ and $+21^{\circ}$.

It was in such circumstances that Nummelin and his four companions lived in the ill-provided house of planks on the Little Briochov Island. They removed to it, as has been already said, on the 5th October: on the 20th the ice was so hard frozen that they could walk upon it. On the 26th snowstorms commenced, so that it was impossible to go out of the house.

The sun was visible for the last time on the 21st November, and it reappeared on the 19th January. On the 15th May the sun no longer set. The temperature was then under the freezing point of mercury. That the upper edge of the sun should be visible on the 19th January we must assume a horizontal refraction of nearly 1° . The islands on the Yenisei are so low that there was probably a pretty open horizon towards the south.

Soon after Christmas scurvy began to show itself. Nummelin's companions were condemned criminals, in whom there was to be expected neither physical nor moral power of resistance to this disease. They all died, three of scurvy, and one in the attempt to cross from the Briochov Islands to a *simovie* at Tolstoinos. In their stead Nummelin succeeded in procuring two men from Tolstoinos, and later on one from Goltchicha. On the 11th May a relief party arrived from the south. It consisted of three men under the mate Meyenwaldt, whom Sidoroff had sent to help to save the vessel. They had first to shovel away the snow which weighed it down. The snow lay nearly six metres deep on the river-ice, which was three metres thick. When they at last had got the vessel nearly dug out, it was buried again by a fresh snowstorm.

In the middle of June the ice began to move, and the river rose so high that Nummelin, Meyenwaldt, and four men, along

with two dogs, were compelled to betake themselves to the roof of the hut, where they had laid in a small stock of provisions and fuel. Here they passed six days in constant peril of their lives.

The river had now risen sixteen feet; the roof of the hut rose but nine inches above the surface of the swollen river, and was every instant in danger of being carried away by a floating piece of ice. In such a case, a small boat tied to the roof was their only means of escape.

The whole landscape was flooded. The other houses and huts were carried away by the water and the drifting ice, which also constantly threatened the only remaining building. The men on its roof were compelled to work night and day to keep the pieces of ice at a distance with poles.

The great inundation had even taken the migrating birds unawares. For long stretches there was not a dry spot for them to rest upon, and thus it happened that exhausted ptarmigan alighted among the men on the roof; once a ptarmigan settled on Meyenwaldt's head, and a pair on the dogs.

On the 23rd June the water began to fall, and by the 25th it had sunk so low that Nummelin and his companions could leave the roof and remove to the deserted interior of the house.

CHAPTER V.

Departure from Port Dickson—Landing on a rocky island east of the Yenisei—Discovery of crystals on the surface of the drift-ice—Cosmic dust—Stay in Actinia Bay—Johannesen's discovery of the island Ensamheten—Arrival at Cape Chelyuskin—The natural state of the land and sea there—Attempt to penetrate right eastwards to the New Siberian Islands—The effect of the mist—Abundant dredging-yield—Preobrascheni Island—Separation from the *Lena* at the mouth of the river Lena.

WHEN on the morning of the 9th August the *Fraser* and *Express* sailed for the point higher up the river where their cargo was lying, the *Vega* and the *Lena* were also ready to sail. I, however, permitted the vessels to remain at Port Dickson a day longer, in order to allow Lieutenant Bove to finish his survey, and for the purpose of determining astronomically, if possible, the position of this important place. In consequence of a continuous fog, however, I had as little opportunity of doing so on this occasion as during the voyage of 1875, which shows what sort of weather prevails during summer at the place where the warm water of the Yenisei is poured into the Arctic Ocean. It was thus not until the morning of the 10th August that the *Vega* and the *Lena* weighed anchor in order to continue their voyage. The course was shaped for the most westerly of the islands, which old maps place off the estuary-bay of the Pyaesina, and named Kammenni Ostrova (Stone Islands), a name which seems to indicate that in their natural state they correspond to the rocky islands about Port Dickson. The sky was hid by mist, the temperature of the air rose to $+10^{\circ}4$ C.; that of the water was at first $+10^{\circ}$,

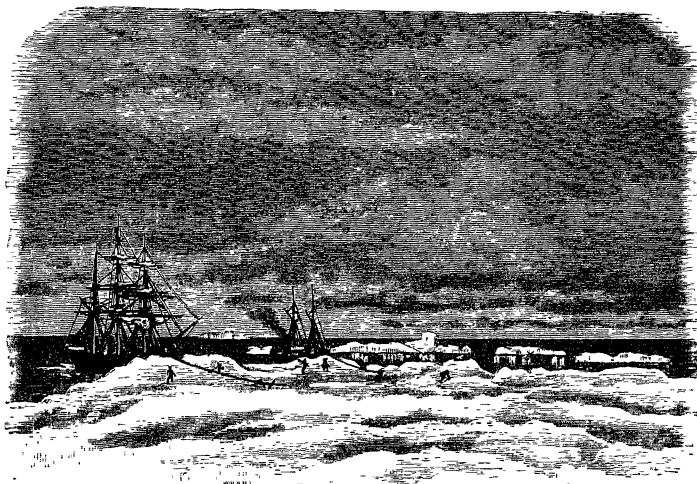
afterwards + 8°; its salinity at the surface of the sea was inconsiderable. No ice was seen during the course of the day. Favoured by a fresh breeze from the south-east, the *Vega* could thus begin her voyage with all sail set. Small rocky islands, which are not to be found on the chart, soon reminded us of the untrustworthiness of the maps. This, together with the prevailing fog, compelled Captain Palander to sail forward with great caution, keeping a good look-out and sounding constantly. Warm weather and an open sea were also favourable for the next day's voyage. But the fog now became so dense, that the *Vega* had to lie-to in the morning at one of the many small islands which we still met with on our way.

Dr. Kjellman, Dr. Almquist, Lieutenant Nordquist, and I, landed here. The bare and utterly desolate island consisted of a low gneiss rock, rising here and there into cliffs, which were shattered by the frost and rather richly clothed with lichens. On the more low-lying places the rock was covered with a layer of gravel, which, through drying and consequent contraction, had burst into six-sided figures, mostly from twelve to twenty inches in diameter. The interior of the figures was completely bare of vegetation, only in the cracks there was to be seen an exceedingly scanty growth of stunted mosses, lichens, and flowering plants. Of the last-named group there were found fifteen species, which could with success, or more correctly without succumbing, survive the struggle for existence on the little poor archipelago, protected by no mountain heights, from the storms of the Polar Sea; but of these species, perhaps a couple seldom develop any flowers. The mosses, too, were in great part without fruit, with the exception of those which grew on the margin, formed of hard clay covered with mud, of a pool, filled with brackish water and lying close to the sea-margin. A large number of pieces of driftwood scattered round this pool showed that the place was occasionally overflowed with sea-water, which thus appears to have been favourable to the development of the mosses. Of lichens Dr. Almquist found a number of species, well developed, and occurring in comparative abundance. On the contrary, the sea, although the surrounding rocky islands

indicated a good bottom for algæ, was so completely destitute of the higher algæ, that only a single microscopic species was found by Dr. Kjellman. No mammalia were seen, not even the usual inhabitant of the desolate rocky islands of the Polar Sea, the Polar bear, who, in regions where he has not made acquaintance with the hunter's ball or lance, in secure reliance on his hitherto unvanquished might, seldom neglects to scrutinise the newly arrived guests from the tops of high rocks or ice-blocks. We saw here only six species of birds. The first of these that attracted our attention was the snow-bunting, which had left the more fertile mountain heights of the south to choose this bare and desolate island in the Arctic Ocean for its breeding-place, and now fluttered round the stone mounds, where it had its nest, with unceasing twitter, as if to express its satisfaction with its choice. Further, two species of waders, *Tringa maritima* and *Phalaropus fulicarius*, were observed running restlessly about the beach to collect their food, which consists of insects. The birds that were killed often had their crops full of the remains of insects, although living at a place where the naturalist has to search for hours to find a dozen gnats or their equals in size, a circumstance that tells very favourably for these birds powers of vision, of locomotion, and of apprehension. It is difficult in any case to understand what it is that attracts this insectivorous bird to one of the regions that is poorest in insect life in the whole world. The glaucous gull's plunderer, the skua, and its chastiser the bold tern, were also observed, as were a few barnacle geese. On the other hand, no eiders were met with. All the birds named occurred only in inconsiderable numbers, and there was nothing found here resembling the life which prevails on a Spitzbergen fowl-island. Finally, it may be mentioned that Lieutenant Nordquist found under stones and pieces of driftwood a few insects, among them a beetle (a staphylinid). Dr. Stuxberg afterwards found a specimen of the same insect species at Cape Chelyuskin itself. No beetle is found on Spitzbergen, though the greater portion of that group of islands is, in respect of climate, soil, and vegetation, much better favoured than the region now in question. This seems to me to show

that the insect fauna of Spitzbergen, exceedingly inconsiderable and limited in numbers as it is, has migrated thither in comparatively recent times, and in how high a degree the migration of beetles is rendered difficult by their inability to pass broad expanses of water.

By afternoon the air had again cleared somewhat, so that we could sail on. A piece of ice was seen here and there, and at night the ice increased for a little to an unpleasant extent. Now,



THE VEGA AND LENA MOORED TO AN ICE-FLOE.

On the morning of the 12th August, 1878. (After a drawing by O. Nordquist)

nowever, it did not occur in such quantity as to prove an obstacle to navigation in clear weather or in known waters.

On the 12th August we still sailed through considerable fields of scattered drift-ice, consisting partly of old ice of large dimensions, partly of very rotten year's ice. It formed, however, no serious obstacle to our advance, and nearer the shore we would probably have had quite open water, but of course it was not advisable to go too near land in the fog and unknown waters,

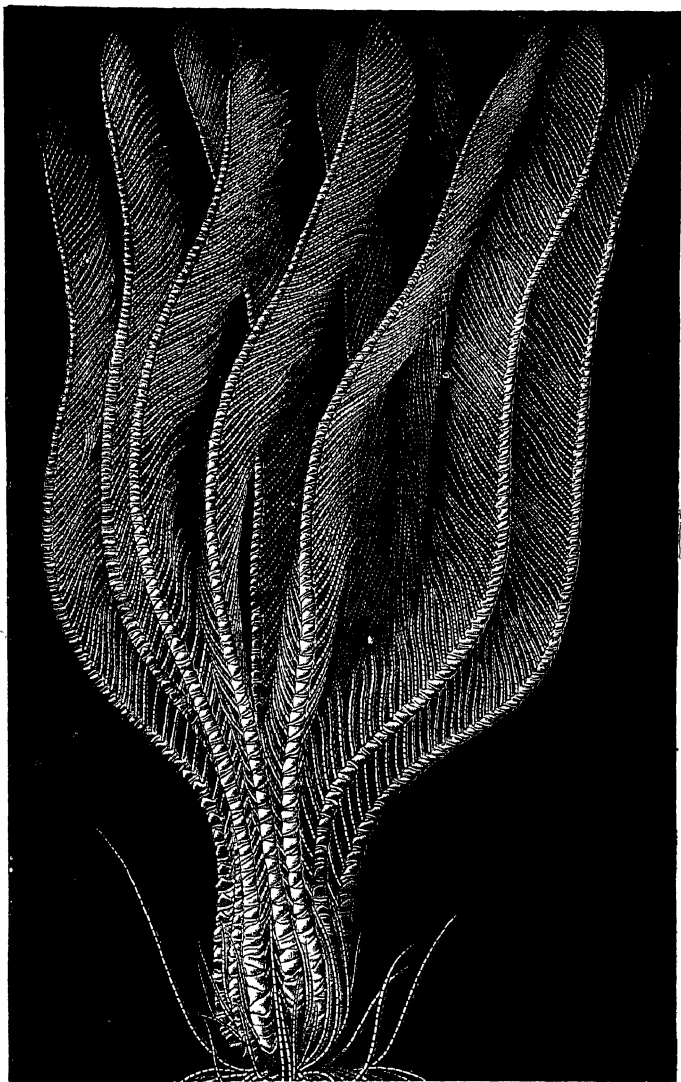
without being obliged. A large number of fish (*Gadus polaris*) were seen above the foot of a large block of ground ice, near which we lay-to for some hours. Next day we saw near one of the islands, where the water was very clear, the sea-bottom bestrewed with innumerable fish of the same species. They had probably perished from the same cause, which often kills fish in the river Obi in so great numbers that the water is infected, namely, from a large shoal of fish having been inclosed by ice in a small hole, where the water, when its surface has frozen, could no longer by absorption from the air replace the oxygen consumed, and where the fish have thus been literally drowned. I mention this inconsiderable find of some dead fish, because vertebrate animals, even fish, which have died a natural death, are found exceedingly seldom. Such finds therefore deserve to be noted with much greater care than, for instance, the occurrence of animal species in the neighbourhood of places where they have been seen a thousand times before. During my nine expeditions in the Arctic regions, where animal life during summer is so exceedingly abundant, the case just mentioned has been one of the few in which I have found remains of recent vertebrate animals which could be proved to have died a natural death. Near hunting-grounds there are to be seen often enough the remains of reindeer, seals, foxes or birds that have died from gunshot wounds, but no Polar bear, seal, walrus, white whale, fox, goose, auk, lemming or other vertebrate that has died naturally. The Polar bear and the reindeer are found there in hundreds, the seal, walrus, and white whale in thousands, and birds in millions. These animals must die a "natural" death in untold numbers. What becomes of their bodies? Of this we have for the present no idea, and yet we have here a problem of immense importance in connection with the formation of fossiliferous strata. It is strange in any case that on Spitzbergen it is easier to find vertebræ of a gigantic lizard of the Trias, than bones of a seal, walrus, or bird that has died naturally, and the same also holds good of more southerly, inhabited lands.

On the 13th August we again sailed past a large number of small rocks or islands. The sea was at first pretty free of ice,

but was afterwards bestrewed with even, thin pieces of drift-ice, which were not forced up on each other, and thus had not been exposed in winter to any ice-pressure. This ice did not cause any inconvenience to the navigation, but at the same time all was wrapt in a very close mist, which soon compelled us to anchor near the shore in a little bay. I endeavoured without success to determine the position of the place by astronomical observations. Along the shore there still remained nearly everywhere a pretty high snow and ice-foot, which in the fog presented the appearance of immense glaciers. The land besides was free of ice. In respect of its geological formation and its animals and plants it resembled completely the island I have just described. But the sea-water here was clear and salt, and the dredging therefore yielded to Dr. Kjellman some large algæ, and to Dr. Stuxberg a large number of marine evertebrates.

When the fog lightened, we immediately steamed on, but we had scarcely got to sea before we were again wrapped in so close a fog that we were compelled to lie-to for the night beside a large piece of drift-ice. The hempen tangles were used, and brought up a very abundant yield of large, beautiful animal forms, a large number of asterids, *Astrophyton*, *Antedon*, &c. We also came here upon an exceedingly remarkable, and to me still a very enigmatical find.

For several years back I have been zealous in the examination of all substances of the nature of dust which fall to the surface of the earth with rain or snow, and I have proved that a portion of them is of cosmic origin. This inconsiderable fall of dust is thus of immense importance for the history of the development of our globe, and we regard it, besides, with the intense interest which we inevitably cherish for all that brings us into actual contact with the material world beyond our globe. The inhabited regions of the earth, however, are not favourable for such investigations, as the particles of cosmic dust falling there in very limited quantity can only with difficulty be distinguished from the dust of civilization, arising from human dwellings, from the refuse of industry, from furnaces and chimneys of steam-engines. The case is quite different on the snow and ice-fields of the High



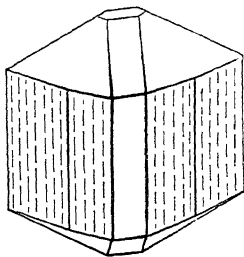
HAIRSTAR FROM THE TAIMUR COAST.

Antedon Eschrichtii, J. MÜLLER. Three fifths of the natural size.

North, remote from human habitations and the tracks of steamers. Every foreign grain of dust can here be easily distinguished and removed, and there is a strong probability that the refuse of civilization is here almost wholly absent. It is evident from this that I would not be disposed to neglect the first opportunity for renewed investigations in the direction indicated, which our involuntary rest at the drift-ice field offered.

Immediately after the *Vega* lay-to, I therefore went down on the ice in order to see whether some such metalliferous dust, as I had before found north of Spitzbergen, was not to be found on the surface. Nothing of the kind, however, was to be seen. On the other hand, Lieutenant Nordquist observed small yellow specks in the snow, which I asked him to collect and hand over for investigation to Dr. Kjellman; for I supposed that the specks consisted of diatom ooze. After examining them Dr. Kjellman however declared that they did not consist of any organic substance, but of crystallised grains of sand. I now examined them more closely, but unfortunately not until the morning after we had left the ice-

field, and then found that the supposed ooze consisted of pale yellow crystals (not fragments of crystals) without mixture of foreign matter. The quantity of crystals, which was obtained from about three litres of snow, skimmed from the surface of the snow on an area of at most 110 square feet, amounted to nearly 3 grains. The crystals were found only near the surface of the snow, not in the deeper layers. They were up to $\cdot 039$ of an inch in diameter, had the appearance shown in the accompanying woodcut, and appeared to belong to the rhombic system, as they had one perfect cleavage and formed striated prisms terminated at either end by truncated pyramids.



FORM OF THE CRYSTALS
Found on the ice off the Taimur coast
Magnified thirty to forty times

Unfortunately I could not make any actual measurements of of them, because after being kept for some time in the air they weathered to a white non-crystalline powder. They lay, without being sensibly dissolved, for a whole night in the water formed by the melting of the snow. On being heated, too, they fell asunder into a tasteless white powder. The white powder, that was formed by the weathering of the crystals, was analysed after our return—21 months after the discovery of the crystals—and was found to contain only carbonate of lime.

The original composition and origin of this substance appears to me exceedingly enigmatical. It was not common carbonate of lime, for the crystals were rhombohedral and did not show the cleavage of calcite. Nor can there be a question of its being arragonite, because this mineral might indeed fall asunder “of itself,” but in that case the newly-formed powder ought to be crystalline. Have the crystals originally been new hydrocarbonate of lime, formed by crystallisation out of the sea-water in intense cold, and then losing its water at a temperature of 10° or 20° C. above the freezing-point? In such a case they ought not to have been found on the surface of the *snow*, but lower down on the surface of the *ice*. Or have they fallen down from the inter-planetary spaces to the surface of the earth, and before crumbling down have had a composition differing from terrestrial substances in the same way as various chemical compounds found in recent times in meteoric stones? The occurrence of the crystals in the uppermost layer of snow and their falling asunder in the air, tell in favour of this view. Unfortunately there is now no possibility of settling these questions, but at all events this discovery is a further incitement to those who travel in the High North to collect with extreme care, from snow-fields lying far from the ordinary routes of communication, all foreign substances, though apparently of trifling importance.

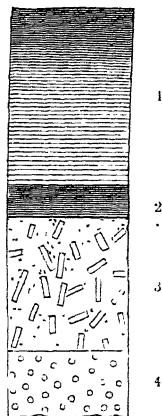
As this question can be answered with the greatest ease and certainty by investigations in the Polar regions, I shall here, for the guidance of future travellers, enumerate some discoveries of a like nature which have been made by me, or at my instance.

1. In the beginning of December, 1871, there happened at

Stockholm an exceedingly heavy fall of snow, perhaps the heaviest which has taken place in the memory of man. Several persons perished in the snow in the immediate neighbourhood of Stockholm. During the last days of the snowfall I had about a cubic metre of snow collected and melted in a vessel. It left a residue of black powder, which contained grains of metallic iron that were attracted by the magnet.

2. In the middle of March, 1872, a similar investigation was made by my brother, KARL NORDENSKIÖLD, in a remote forest settlement, Evois, in Finland. Here, too, was obtained, on the melting of the snow, a small residuum, consisting of a black powder containing metallic iron.

3. On the 8th August and 2nd September of the same year, I examined, north of Spitzbergen, in 80° N.L., and 13° to 15° E.L., the layer of snow that there covered the ice. The nature of this layer is shown by the accompanying woodcut, in which 1, is new-fallen snow; 2, a layer of hardened old snow, eight mm. in thickness; 3, a layer of snow conglomerated to a crystalline granular mass; and 4, common granular hardened snow. Layer 3 was full of small black grains, among which were found numerous metallic particles that were attracted by the magnet, and were found to contain iron, cobalt, and possibly nickel also.



SECTION OF THE UPPER
PART OF THE SNOW ON
A DRIFT-ICE FIELD IN
 80° N. L.

One-half the natural size

4. On the melting of 500 gram. hail, which fell in Stockholm in the autumn of 1873, similar metallic particles containing cobalt (nickel) were obtained, which, in this case might possibly have come from the neighbouring roofs, because the hail was collected in a yard surrounded by houses roofed with sheet-iron painted red. The black colour of the metallic particles inclosed in the hail, their position in the hail, and finally, the cobalt

they contained, however, indicate in this case too, a quite different origin.

5. In a dust (kryokonite) collected on the inland ice of Greenland in the month of July, 1870, there were also found mixed with it grains of metallic iron, containing cobalt. The main mass consisted of a crystalline, double-refracting silicate, drenched through with an ill-smelling organic substance. The dust was found in large quantities at the bottom of innumerable small holes in the surface of the inland ice. This dust could scarcely be of volcanic origin, because by its crystalline structure it differs completely from the glass-dust that is commonly thrown out of volcanoes, and is often carried by the wind to very remote regions, as also from the dust which, on the 30th March, 1875, fell at many places in the middle of Scandinavia, and which was proved to have been thrown out by volcanoes in Iceland. For, while kryokonite consists of small angular double-refracting crystal-fragments without any mixture of particles of glass, the volcanic Haga-dust¹ consists almost wholly of small microscopic glass bubbles that have no action on the polarisation-planes of the light that passes through them.

Similar investigations have since been made, among others, by M. TISSANDIER in Paris, and during NARES' English Polar Expedition.

It may appear to many that it is beneath the dignity of science to concern one's self with so trifling an affair as the fall of a small quantity of dust. But this is by no means the case. For I estimate the quantity of the dust that was found by me in 1872 on the ice north of Spitzbergen at from $\frac{1}{880}$ to $\frac{1}{66}$ of a grain per

¹ I use this name because the ash-rain of March 1875 was first observed at Haga palace near Stockholm, and thus at the outer limit of the known area of distribution of the dust. It was first through the request which in consequence of this observation was published in the newspapers, that communications regarding singular observations in other quarters should be sent to the Swedish Academy of Sciences, that it became known that a similar rain had about the same time taken place over a very large part of middle Sweden and Norway. The dust however did not fall evenly, but distributed in spots, and at several different times. The distance from Stockholm of the volcanoes, where the outbreak took place, is nearly 2000 kilometres.

square yard, and probably the whole fall of dust for the year far exceeded the latter figure. But $\frac{1}{8}$ of a grain on every square yard of the surface of the earth amounts for the whole globe to 500,000 tons! Such a mass collected year by year during the geological ages, of a duration probably incomprehensible by us, forms too important a factor to be neglected, when the fundamental facts of the geological history of our planet are enumerated. A continuation of these investigations will perhaps show that our globe has increased gradually from a small beginning to the dimensions it now possesses; that a considerable quantity of the constituents of our sedimentary strata, especially of those that have been deposited in the open sea far from land, are of cosmic origin; and will throw an unexpected light on the origin of the fire-hearths of the volcanoes, and afford a simple explanation of the remarkable resemblance which unmistakably exists between plutonic rocks and meteoric stones.¹

On the 14th August, when the fog had lightened a little, we got up steam, but were soon compelled to anchor again in a bay running into Taimur Island from the north side of Taimur Sound, which I named Actinia Bay, from the large number of actinia which the dredge brought up there. It is, besides, not the only place in the Kara Sea which might be named from the invertebrate life prevailing there, so unexpectedly abundant.

Unfavourable weather detained us in Actinia Bay, which is a good and well-protected haven, till the 18th August, during which time excursions were made in various directions, among others farther into Taimur Sound, where a variable strong current was found to prevail. The Sound is too shallow to be passed through by large vessels. The rocks round Taimur Sound consist of gneiss strata, forming low ridges which have been so shattered by the frost that they have been converted into immense

¹ Namely, by showing that the principal material of the plutonic and volcanic rocks is of cosmic origin, and that the phenomena of heat, which occur in these formations, depend on chemical changes to which the cosmic sediment, after being covered by thick terrestrial formations, is subjected.

lichen-clad stone mounds. Between these stretch extensive valleys and plains, now free of snow, if we except a snow-drift remaining here and there in the hollows. The plains were all covered with a very green continuous vegetation, which however on a closer examination was found to be not a true turf, but a mixture of grasses, allied plants, and a large number of different kinds of mosses and lichens. Actual flowers were found here only sparingly. In this respect the coast *tundra* shows a remarkable difference from the coast lands on Vaygats Island and Novaya Zemlya. On the other hand, the abundance of luxuriant lichens and mosses was striking. The mosses along the beach and the borders of the snow-drifts remaining here and there bore fruit in abundance. Animal life on land was scanty; some few reindeer were seen, a mountain fox was killed, and a lemming caught. In the sea the higher animal life was somewhat more abundant.

An exceedingly persistent fog prevailed during the whole of the time we remained here, but at last on the 18th it lightened a little. We immediately weighed anchor and steamed along the western shore of Taimur Island. It is surrounded by a large number of islands that are not given on the map, and possibly Taimur Island itself is divided by sounds into several parts. During our voyage, however, the fog, still very close, hindered us from mapping, otherwise than in a very loose way, the islands, large and small, between and past which the *Vega* searched for a passage. So much we could in any case see, that the northern extremity of Taimur Island does not run so far north as the common maps show.

Ice we met with only in small quantity, and what we saw was very rotten fjord or river ice. I scarcely believe that in the course of the day we met with a single piece of ice large enough to flense a seal upon. We had as yet seen no true old drift-ice such as is to be met with north of Spitzbergen. In respect to the nature of the ice, there is a complete dissimilarity between the Kara Sea and the sea north and east of Spitzbergen. Another striking difference is the scarcity of warm-blooded animals which prevails in this region, hitherto exempted from all hunting. In

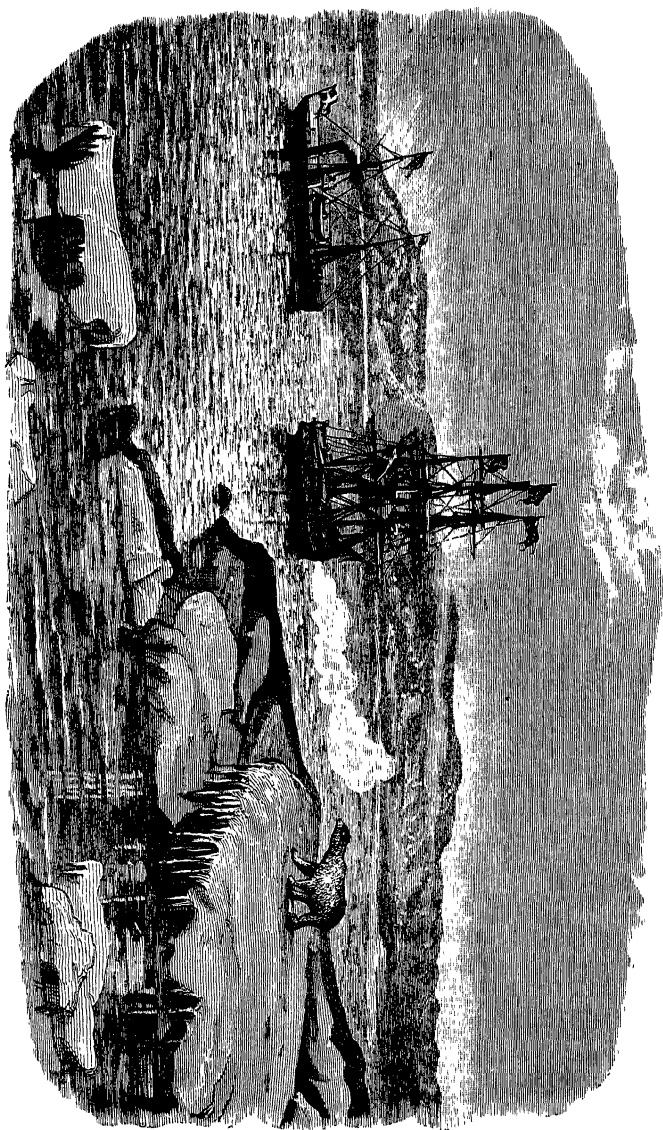
the course of the day we had not seen a single bird—something which never before happened to me during a summer journey in the Arctic regions—and scarcely any seals.

On the 19th August we continued to sail and steam along the coast, mostly in a very close fog, which only at intervals dispersed so much that the lie of the coast could be made out. In order that they might not be separated, both vessels had often to signal to each other with the steam-whistle. The sea was bright as a mirror. Drift-ice was seen now and then, but only in small quantity and very rotten; but in the course of the day we steamed past an extensive unbroken ice-field, fast to the land, which occupied a bay on the west side of the Chelyuskin peninsula. The ice of which it consisted, appeared in the mist immensely rough and high, although in fact it was nearly as rotten as that of which the narrow belts of ice were formed which we now and then met with out at sea.

The fog prevented all view far across the ice, and I already feared that the northernmost promontory of Asia would be so surrounded with ice that we could not land upon it. But soon a dark, ice-free cape peeped out of the mist in the north-east. A bay open to the north here cuts into the land, and in this bay both the vessels anchored on the 19th August at 6 o'clock p.m.

We had now reached the goal, which for centuries had been the object of unsuccessful struggles: for the first time a vessel lay at anchor off the northernmost cape of the old world. No wonder then that the occurrence was celebrated by a display of flags and the firing of salutes, and, when we returned from our excursion on land, by festivities on board, by bumpers and toasts.

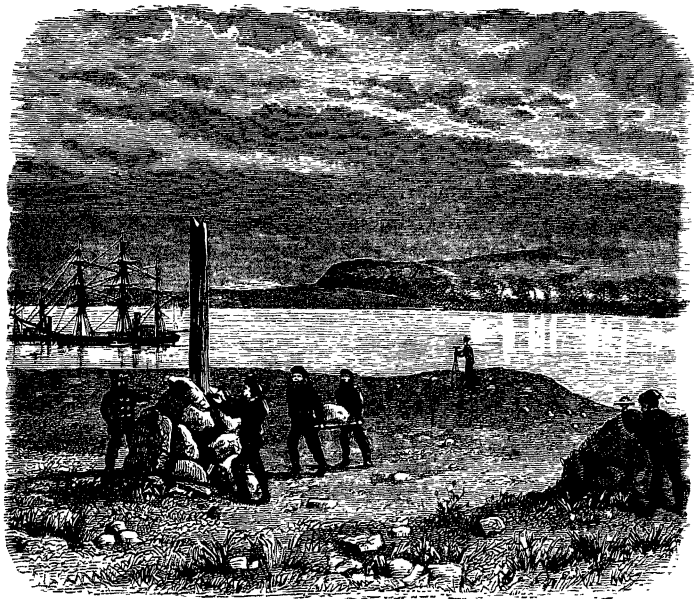
As on our arrival at the Yenisei, we were received here too by a large Polar bear, who even before the vessel anchored, was seen to go backwards and forwards on the beach, now and then turning his glance and his nose uneasily out to sea in order to investigate what strange guests had now for the first time come to his kingdom. A boat was put off to kill him. Brusewitz was the chosen shot; but on this occasion the bear took care



THE VEGA AND LENA SALUTING CAPE CHELYUSKIN.
(After a drawing by A. Høygaard.)

not to form any close acquaintance with our guns. The firing of the salute put him so thoroughly to flight, that he did not, as bears are wont, return the following day.

The north point of Asia forms a low promontory, which a bay divides into two, the eastern arm projecting a little farther to the north than the western. A ridge of hills with gently sloping



VIEW AT CAPE CHELYUSKIN DURING THE STAY OF THE EXPEDITION.

(After a drawing by A. Hovgaard.)

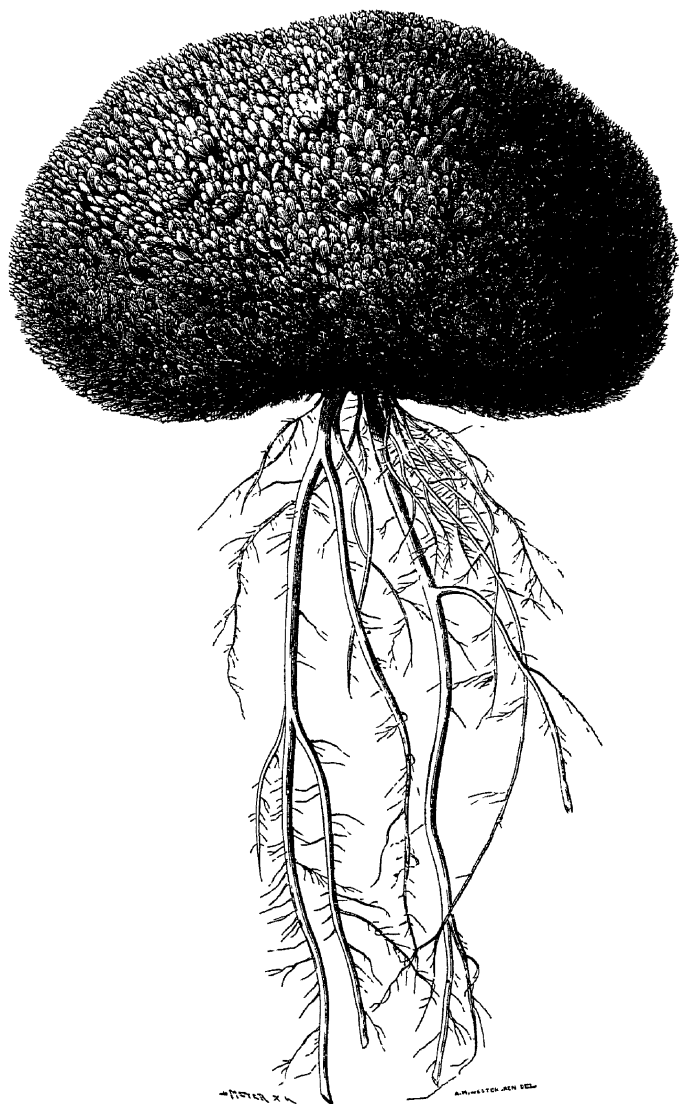
sides run into the land from the eastern point, and appears within sight of the western to reach a height of 1000 feet. Like the plains lying below, the summits of this range were nearly free of snow. Only on the hill sides or in deep furrows excavated by the streams of melted snow, and in dales in the plains, were large white snow-fields to be seen. A low ice-foot still remained at most

places along the shore. But no glacier rolled its bluish-white ice-masses down the mountain sides, and no inland lakes, no perpendicular cliffs, no high mountain summits, gave any natural beauty to the landscape, which was the most monotonous and the most desolate I have seen in the High North.

As on the island off which we lay at anchor on the 11th August, the ground was everywhere cracked into more or less regular six-sided figures, the interior of which was usually bare of vegetation, while stunted flowering-plants, lichens and mosses, rose out of the cracks. At some few places, however, the ground was covered with a carpet of mosses, lichens, grasses and allied plants, resembling that which I previously found at Actinia Bay. Yet the flowering-plants were less numerous here, and the mosses more stunted and bearing fruit less abundantly. The lichen flora was also, according to Dr. Almquist's examination, monotonous, though very luxuriant. The plants were most abundant on the farthest extremity of the Cape. It almost appeared as if many of the plants of the Taimur country had attempted to migrate hence farther to the north, but meeting the sea, had stood still, unable to go farther, and unwilling to turn. For here Dr. Kjellman found on a very limited area nearly all the plants of the region.

There were found in all only twenty-three species of inconsiderable flowering-plants, among them eight species belonging to the Saxifrage family, a sulphur-yellow poppy, commonly cultivated in our gardens, and the exceedingly beautiful, forget-me-not-like *Eritrichium*. That the vegetation here on the northernmost point of Asia has to contend with a severe climate is shown, among other things, as Dr. Kjellman has pointed out, by most of the flowering-plants having a special tendency to form exceedingly compact half-globular tufts.

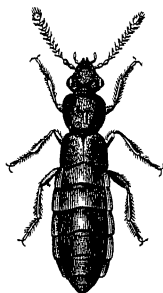
The only insects which occurred here in any large number were poduræ, but some flies were also seen, and even a beetle, the before-mentioned Staphylinid. Of birds, there were seen a large number of sand-pipers, and exceedingly numerous flocks of barnacle geese—evidently migrating to more southerly regions, perhaps from some Polar land lying to the north of Cape Chelyuskin—a loon, some kittiwakes and ivory gulls, and remains of owls.



DRABA ALPINA L., FROM CAPE CHELYUSKIN.
Natural size

Mammalia were represented by the bear already mentioned, and by the reindeer and the lemming, whose traces and dung were seen on the plains. In the sea, a walrus, several rough seals, (*Phoca hispida*), and two shoals of white whales were seen.

All rivers were now dried up, but wide, shallow river-beds indicated that during the snow-melting season there was an abundant flow of water. The rush of snow rivulets and the cry of birds then certainly cause an interruption in the desolation and silence which were now spread over the clay beds of the



†

THE BEETLE LIVING FARTHEST
TO THE NORTH.

Micalymma Dicksoni.
MARK

Magnified twelve times.

plains, nearly bare of all vegetation. Probably, however, a little farther into the country, in some valley protected from the winds of the Polar Sea, we might find quite different natural conditions, a more abundant animal life, and a vegetable world, in summer, as rich in flowers as that which we meet with in the valleys of Ice Fjord or the "Nameless Bay" (Besimannaja Bay). We saw no trace of man here. The accounts, which were current as early as the sixteenth century, relating to the nature of the north point of Asia, however, make it probable that the Siberian nomads at one time drove their reindeer herds up hither. It is even not impossible that Russian hunters from Chatanga

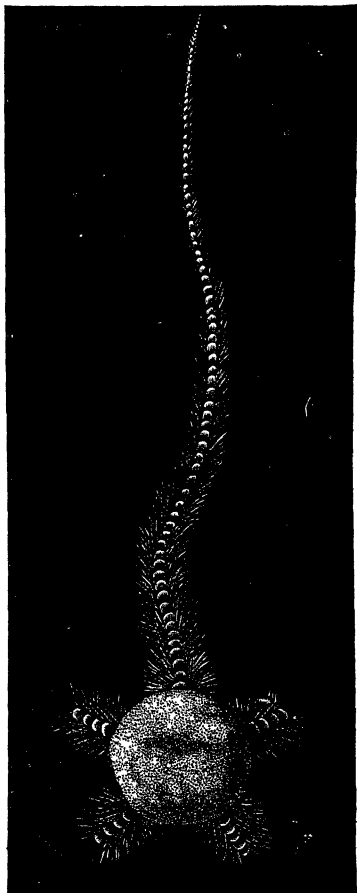
may have prosecuted the chase here, and that Chelyuskin actually was here, of which we have evidence in the very correct way in which the Cape, that now rightly bears his name, is laid down on the Russian maps.

The rocks consist of a clay-slate, with crystals resembling chias tolite and crystals of sulphide of iron interspersed. At the Cape itself the clay-slate is crossed by a thick vein of pure white quartz. Here, according to an old custom of Polar travellers, a stately cairn was erected.

In order to get a good astronomical determination of the

position of this important point I remained there until the 20th August at noon. The *Lena* was ordered to steam out to dredge during this time. Eight minutes north of the bay, where we lay at anchor, heavy and very close ice was met with. There the depth of the sea increased rapidly. Animal life at the sea-bottom was very abundant, among other things in large asterids and ophiurids.

According to the plan of the voyage I now wished to steam from this point right eastwards towards the New Siberian Islands in order to see if we should fall in with land on the way. On the 20th and 21st we went forward in this direction among scattered drift-ice, which was heavier and less broken up than that which we had met with on the other side of Taimur Land, but without meeting with any serious obstacles. We fell in also with some very large ice-floes, but not with any icebergs. We were besides again attended by



OPHIURID FROM THE SEA NORTH OF CAPE
CHELYUSKIN.

Ophiacantha bidentata, RETZ.

One and one-third of the natural size.

so dense a mist that we could only see ice-fields and pieces of ice in the immediate neighbourhood of the vessel. Besides species of Lestris and kittiwakes we now also saw looms, birds that are almost wanting in the Kara Sea. Johannesen was of opinion that the presence of these birds showed that the sea is not completely frozen over in winter, because it is not probable that the loom in autumn and spring would fly across the frozen Kara Sea to seek in this distant region its food and its breeding-haunts.

The night before the 22nd we steamed through pretty close ice. The whole day so thick a fog still prevailed that we could not see the extent of the ice-fields in the neighbourhood of the vessel. Towards noon we were, therefore, compelled to take a more southerly course. When we found that we could not advance in this direction, we lay-to at a large ice-floe, waiting for clear weather, until in the afternoon the fog again lightened somewhat, so that we could continue our voyage. But it was not long before the fog again became so thick that, as the sailors say, you could cut it with a knife. There was now evidently a risk that the *Vega*, while thus continuing to "box the compass" in the ice-labyrinth, in which we had entangled ourselves, would meet with the same fate that befell the *Tegetthoff*. In order to avoid this, it became necessary to abandon our attempt to sail from Cape Chelyuskin straight to the New Siberian Islands, and to endeavour to reach as soon as possible the open water at the coast.

When it cleared on the morning of the 23rd, we therefore began again to steam forward among the fields of drift-ice, but now not with the intention of advancing in a given direction, but only of getting to open water. The ice-fields we now met with were very much broken up, which was an indication that we could not be very far from the edge of the pack. But notwithstanding this, all our attempts to find penetrable ice in an easterly, westerly, or southerly direction were unsuccessful. We had thus to search in a northerly direction for the opening by which we had sailed in. This was all the more unpleasant that the wind had changed to a pretty fresh N.W. breeze, on which account, with the *Vega's* weak steam-power, we could make way only slowly. It was not

until 6.30 p.m. that we at last came to the sack-formed opening in the ice through which we had sailed in at noon of the previous day.

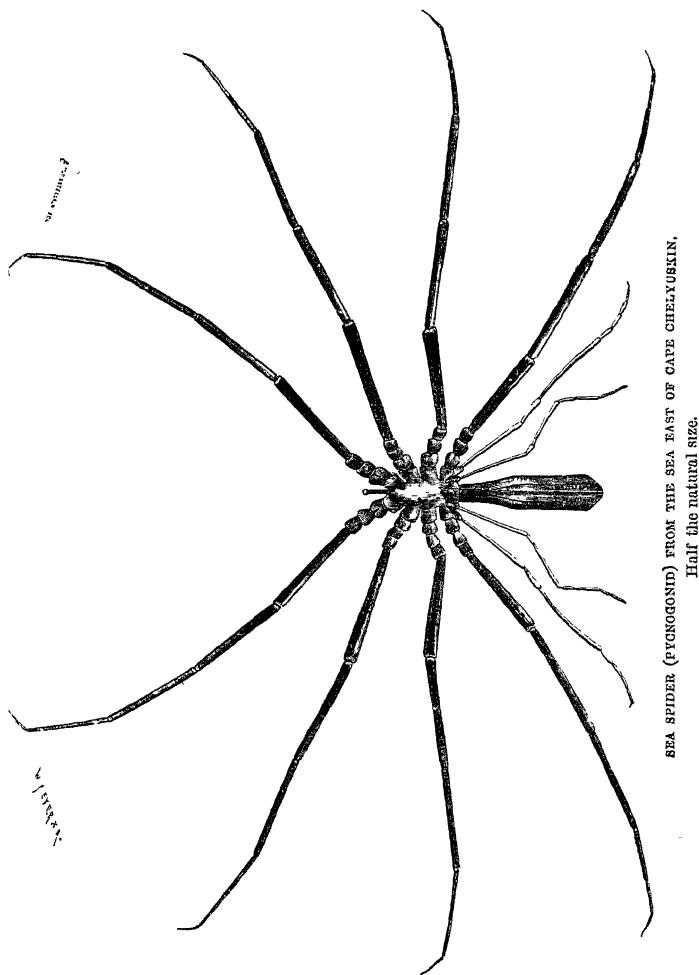
One can scarcely, without having experienced it, form any idea of the optical illusions which are produced by mist, in regions where the size of the objects which are visible through the fog is not known beforehand, and thus does not give the spectator an idea of the distance. Our estimate of distance and size in such cases depend wholly on accident. The obscure contours of the fog-concealed objects themselves, besides, are often by the ignorance of the spectator converted into whimsical fantastic forms. During a boat journey in Hinloopen Strait I once intended to row among drift-ice to an island at a distance of some few kilometres. When the boat started the air was clear, but while we were employed, as best we could, in shooting sea-fowl for dinner, all was wrapt in a thick mist, and that so unexpectedly, that we had not time to take the bearings of the island. This led to a not altogether pleasant random row among the pieces of ice that were drifting about in rapid motion in the sound. All exerted themselves as much as possible to get sight of the island, whose beach would afford us a safe resting-place. While thus occupied, a dark border was seen through the mist at the horizon. It was taken for the island which we were bound for, and it was not at first considered remarkable that the dark border rose rapidly, for we thought that the mist was dispersing and in consequence of that more of the land was visible. Soon two white snow-fields, that we had not observed before, were seen on both sides of the land, and immediately after this was changed to a sea-monster, resembling a walrus-head, as large as a mountain. This got life and motion, and finally sank all at once to the head of a common walrus, which lay on a piece of ice in the neighbourhood of the boat; the white tusks formed the snow-fields and the dark-brown round head the mountain. Scarce was this illusion gone when one of the men cried out "Land right a head—high land!" We now all saw before us a high Alpine region, with mountain peaks and glaciers, but this too sank a moment afterwards all at once to a common ice-border, blackened with earth. In the spring of 1873

Palander and I with nine men made a sledge journey round North-East Land. In the course of this journey a great many bears were seen and killed. When a bear was seen while we were dragging our sledges forward, the train commonly stood still, and, not to frighten the bear, all the men concealed themselves behind the sledges, with the exception of the marksman, who, squatting down in some convenient place, waited till his prey should come sufficiently within range to be killed with certainty. It happened once during foggy weather on the ice at Wahlenberg Bay that the bear which was expected and had been clearly seen by all of us, instead of approaching with his usual supple zig-zag movements, and with his ordinary attempts to nose himself to a sure insight into the fitness of the foreigners for food, just as the marksman took aim, spread out gigantic wings and flew away in the form of a small ivory gull. Another time during the same sledge journey we heard from the tent in which we rested the cook who was employed outside, cry out: "A bear! a great bear! No! a reindeer, a very little reindeer." The same instant a well-directed shot was fired, and the bear-reindeer was found to be a very small fox, which thus paid with its life for the honour of having for some moments played the part of a big animal. From these accounts it may be seen how difficult navigation among drift-ice must be in unknown waters.

On the two occasions on which the vessel was anchored to ice-floes the trawl-net was used, and the hempen tangles. The net was drawn forward slowly with the ice which was drifting to the north-west before a fresh S.E. breeze which was blowing at the time. The yield of the trawling was extraordinarily abundant; large asterids, crinoids, sponges, holothuria, a gigantic sea-spider (Pycnogonid), masses of worms, crustacea, &c. *It was the most abundant yield that the trawl-net at any one time brought up during the whole of our voyage round the coast of Asia*, and this from the sea off the northern extremity of that continent.

Among the forms collected here we may specially refer to the large sea-spider, of which a drawing is given (p.115); and three specimens of small stalked crinoids. The depth varied between 200 and 330 feet. The temperature of the water was at the surface

+0° to -0°·6 C. ; at the bottom -1°·4 to 1°·6 ; its salinity was



SEA SPIDER (PYCNOGONID) FROM THE SEA EAST OF CAPE CHERYUSKIN.
Half the natural size.

considerable, both at the bottom, where it was very nearly equal

to that of the other great oceans, and at the surface where it was indeed about a fifth-part less, but yet much greater than that of the surface-water in the Kara Sea.

It is singular that a temperature under the freezing-point of pure water should be advantageous for the development of an animal life so extremely rich as that which is found here, and that this animal life should not suffer any harm from the complete darkness, which during the greater portion of the year prevails at the bottom of the ice-covered sea.

When we got out of the ice we steamed towards the land, which was sighted on the 23rd at 8.45 p.m. The land was low and free from snow; the depth of the sea at a distance of six miles from the coast varied between forty-two and fifty feet. The coast here stretched from north to south. We followed it a distance of from four to six miles. A north-westerly breeze here carried the vessel, without the help of steam, rapidly forward over a completely smooth sea.

On the 24th August we still sailed along the land towards the south. The depth of the sea now increased to 108 feet at a distance of six miles from land. The land rose gradually, and some distance from the coast beautiful mountain chains were seen, which, judging by the eye, rose to a height of from 1,900 to 3,000 feet. They were, like the plains along the coast, quite free from snow. Only in the clefts of the mountains there remained some patches of snow or ice, which at two places appeared to form true glaciers, terminating however at a considerable height above the sea. The snow-free slopes between the foot of the mountain and the shore bank, 100 to 200 feet high, formed an even plain, covered by a brownish-green turf, probably of the same nature as that we saw on Taimur Island.

During the forenoon we had splendid clear weather, and often we could see from the vessel no trace of ice. We saw a large number of walruses, and to judge by the fire which this sight kindled in the eyes of our hunters, it will not be long till the Norwegian hunting voyages are extended to the sea north and east of the north point of Asia. We saw besides a large number of looms and black guillemots; the former accompanied by young

of the year, as large as rotges. About noon we sighted "land ahead to larboard." It was evidently Preobrascheni Island. I determined to land on it for a few hours to investigate its natural history, and to fix the position of the place by astronomical observations, if the weather should permit. The distance of this high-lying island was however greater than we expected; so that it was not until six o'clock in the evening that we could anchor off its south-west side, near the almost perpendicular face of cliffs abounding in sea-fowl.

During the last two days we had been sailing over a region, which on recent maps is marked as land. This shows that a considerable change must be made on the map of North Siberia, and I shall therefore quote here the observations on which the determination of our course is grounded.

	<i>Observed</i>	
	Latitude.	Longitude.
Cape Chelyuskin ¹	77°36'8"	103°17'2"
On board the <i>Vega</i> ¹ at noon of the 21st Aug.	77°25'	109°12'
" " " " " " " " 22nd "	76°53'	116° 9'
" " " " " " " " 23rd "	76°48'	115° 0'
" " " " " " " " 24th "	75° 0'	113°33'

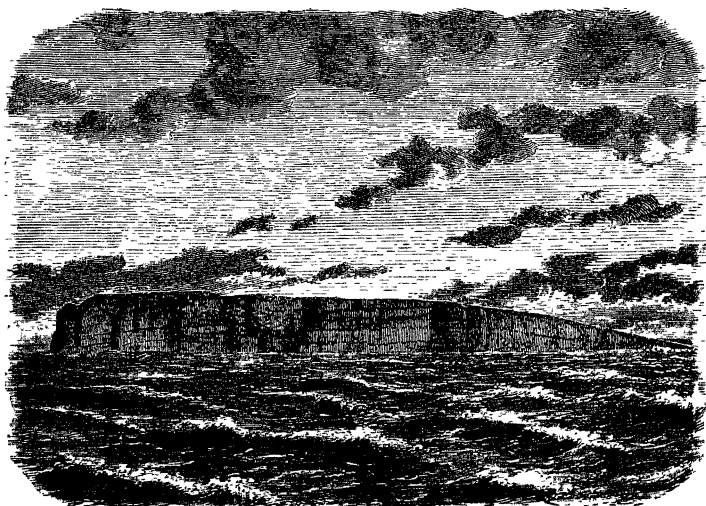
At the last-mentioned point we had land to starboard of us at an estimated distance of 4'. Preobrascheni Island lay S. 21° W. 17·5' off. It is on the ground of these data and of the courses recorded in the log, that the track of the *Vega* has been laid down on the map, and no doubt can arise that the position of the east coast of Taimur peninsula, as indicated by us, is in the main correct.

Preobrascheni Island forms a pretty even grassy plain, lying from 100 to 200 feet above the sea-level, which in the north-west terminates towards the sea with an almost perpendicular rocky wall, but to the south-east sinks gradually down to two sand-banks which run far out to sea. At the time of our visit the

¹ According to an observation with an artificial horizon on land.

² According to an observation on board. The observations for longitude that were made some hours before or after noon are reduced to noon.

island was free of snow and covered with a carpet of mosses mixed with grass, which was exceedingly abundant, especially on the south-west slopes of the island, protected as they were from the north winds. Here we encountered anew the Arctic animal world in all its profusion. The ledges of the perpendicular shore-cliffs of the island formed the breeding-place of numberless looms and kittiwakes, to which a few black guillemots attached themselves. Along



PREOBRASCHENI ISLAND

(After a sketch by O. Nordquist.)

the farthest margin of the beach waders ran busily backwards and forwards in order to collect their food. At the summits of the cliffs a flock of glaucous gulls were breeding, and on the slopes of the low land the white mountain owl was seen lying in wait for its prey, quiet and motionless for hours, but as usual it was wary and shy, so that it was only with difficulty that the hunter could get within range of it. At some places there extended between the foot of the "loomery" and the sea a stony beach, which at

high water was mostly covered by the sea, and at low water was full of shallow salt-water pools. Here had settled two Polar bears that were soon killed, one by Lieutenant Brusewitz, the other by Captain Johannesen. The bears had evidently been on the hunt for looms, which along with their young as large as rotges, were swimming in the pools of water at the foot of the "loomery;" though probably they were lying in wait for birds which by some accident might happen to fall down from the breeding-place. In the sea no small number of seals were seen, and but a few hours before our arrival at the island we had sailed past herds of walrus.

Vegetation was much more luxuriant and richer in species than at Cape Chelyuskin, and naturally bore a more southern character, not only in consequence of the more southerly position of the island, but also on account of its shores being washed by the water of the Khatanga river, which is warm during summer.

Unfortunately on account of the advanced season of the year I could only allow the *Vega* to remain a few hours off this interesting island, and at 10.30 p.m. accordingly the anchor was weighed and our voyage along the coast resumed.

On the 25th, 26th, and 27th August we had for the most part calm, fine weather, and the sea was completely free of ice. The temperature of the water again rose to $+ 5^{\circ} 8$ c. and its salinity diminished considerably. But the depth now decreased so much, that, for instance, on the night before the 26th we had great difficulty in getting past some shoals lying west of the delta of the Lena, off the mouth of the Olonek.

It had originally been my intention to let the *Vega* separate from the *Lena* at some anchorage in one of the arms of the delta of the Lena river. But on account of the shallowness of the water, the favourable wind, and the ice-free sea, that now lay before us to the eastward, I determined to part from the *Lena* in the open sea off Tumat Island. This parting took place on the night between the 27th and 28th August, after Captain Johannesen had been signalled to come on board the *Vega*, to receive

orders, passport,¹ and letters for home. As a parting salute to our trusty little attendant during our voyage round the north point of Asia some rockets were fired, on which we steamed or sailed on, each to his destination.

During our passage from Norway to the Lena we had been much troubled with fog, but it was only when we left the navigable water along the coast to the east of Cape Chelyuskin that we fell in with ice in such quantity that it was an obstacle to our voyage. If the coast had been followed the whole time, if the weather had been clear and the navigable water sufficiently surveyed, so that it had been possible to keep the course of the vessel near the land, the voyage of the *Vega* to the mouth of the Lena *would never have been obstructed by ice*, and I am convinced that this will happen year after year during the close of August, at least between the Yenisei and the Lena. For I believe that the place where ice obstacles will perhaps be met with most frequently will not be the north point of Asia, but the region east of the entrance to the Kara Sea.

¹ Before our departure, I had through the Swedish Foreign Office obtained from the Russian Government letters patent in which the Russian authorities with whom we might come in contact were instructed to give us all the assistance that circumstances might call for.

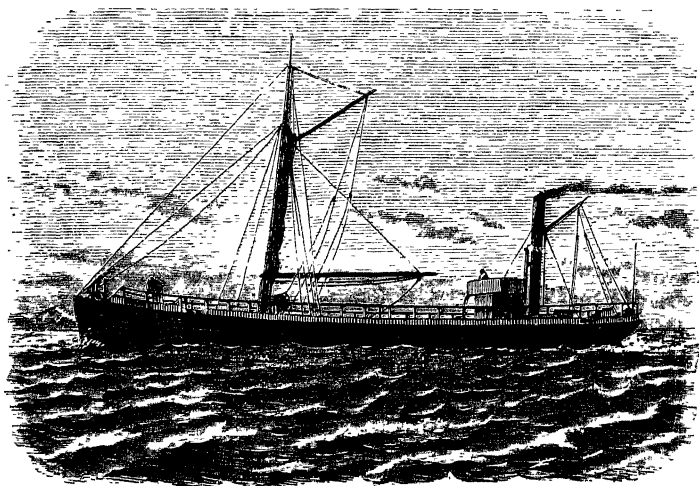
CHAPTER VI.

The voyage of the *Fraser* and the *Express* up the Yenisei and their return to Norway—The voyage of the *Lena* through the delta and up the river to Yakutsk—The natural state of Siberia in general—The river territories—The fitness of the land for cultivation and the necessity for improved communications—The great rivers, the future commercial highways of Siberia—Voyage up the Yenisei in 1875—Sibiriakoff's Island—The *tundra*—The primeval Siberian forest—The inhabitants of Western Siberia: the Russians, the Exiles, the "Asiatics"—Ways of travelling on the Yenisei: dog-boats, floating trading stores propelled by steam—New prospects for Siberia.

I HAVE mentioned in the introduction that the *Vega* during the first part of the voyage was accompanied by three other vessels, which together with the principal vessel of the Expedition stood at my disposal and under my orders, and I have stated in passing that their voyages too deserve a place in the history of navigation. Now, when we were parted from the vessel which had accompanied the *Vega* farthest in her route eastwards, it may be the proper place to give a brief account of the close of the voyages of the *Fraser*, the *Express*, and the *Lena*, and give reasons for what I have said of the importance of these voyages.

On the 9th August at 10 a.m. after Mr. Serebrenikoff had gone on board the *Express* to take command, as Sibiriakoff's commissioner, of the two vessels bound for the Yenisei, the *Fraser*, with the *Express* in tow, started from Port Dickson for the river. The voyage passed without other adventures except that in consequence of unacquaintance with the navigable waters the vessel sometimes gently grounded. On the 14th August the vessels reached Tolstinoi, where a very well preserved *simovie* is

situated about $70^{\circ} 10'$ N. L., 220 miles south of Port Dickson. On the 15th August they anchored in a good haven at Saostrovskoi, a *simovie* lying 60 miles farther up the river at the limit of trees, where the goods were to be discharged and another cargo taken on board. After a jetty had been constructed on the 16th, the landing of the goods began on the 17th, and was finished on the 20th. The *Fraser* went still farther up the river to Dudino, in order to load various goods laid up there—tallow, wheat, rye,



THE STEAMER "FRASER"

and oats. On the 2nd September the steamer returned to Saostrovskoi, where in the meantime the *Express* had taken on board her cargo.

Dudino is a church village, situated at the point where the river Dudinka flows into the Yenisei. Here live two priests, a *smotritel* (a police official), a couple of exiles, some Russian workmen, and a number of natives, as well as the owner of the place, the influential merchant SOTNIKOFF. This active and able man,

is in an economical point of view ruler over the whole of the surrounding region, all whose inhabitants are in one way or other dependent upon him. He exchanges grain, brandy, sugar, tea, iron goods, powder and lead, cloth and leather, for furs, fish, mammoth-ivory, &c.; and these goods are sent by steamer to Yeniseisk to be forwarded from thence to China, Moscow, St. Petersburg, &c. Among other things he is also the owner of very thick coal-seams in the Noril Mountains lying about 36 miles from Dudino. This simple and unostentatious man has been very obliging to all the scientific men who have visited the region. His dwelling, situated in the neighbourhood of the limit of trees, is probably the stateliest palace of the Siberian *tundra*, admired by natives from far and near. It is built of large logs, consists of two stories, has a roof painted green, many windows with decorated frames painted white and blue; the rooms are warm, provided with carpets of furs, pot-flowers in the windows, numerous sacred pictures, photographs, and copper engravings.

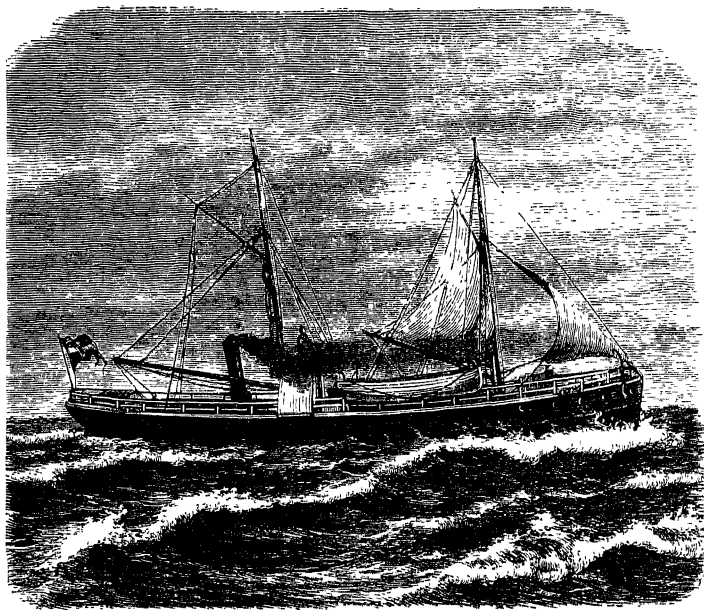
On the 7th September all was ready for departure. The *Fraser* and *Express* weighed anchor to commence the return voyage down the river. At Tolstoinos two days after they met the steamer *Moskwa*¹ of Bremen, Captain Dallmann. On the 19th September all the three vessels arrived at Matotschkin Sound, and on the 26th anchored at Hammerfest in good condition and with full cargoes.² The goods, which now for the first time were carried from the Yenisei to Europe, consisted of about 600 tons—tallow, wheat, rye, and oats. The goods imported into Siberia consisted mainly of 16 tons nails, 8 tons horseshoes, 4 tons horsenails, 16½ tons bar iron, 33 tons tobacco, 60 tons salt, 24 casks petroleum, an iron lighter in pieces with the necessary adjuncts of anchors, &c.

¹ The *Moskwa* was the first steamer which penetrated from the Atlantic to the town of Yeniseisk.

² The particulars of the voyages of these vessels are taken from a copy which I have received of Captain Emil Nilsson's log.

³ The goods carried by me and by Wiggins to the Yenisei in 1876, and those which Schwanenberg carried thence in 1877, were properly only samples on a somewhat large scale.

It is naturally very difficult for a vessel to seek her way without a pilot through an extensive delta completely unknown in a hydrographic respect, and crossed by a large number of deeper or shallower river arms. Mr. Sibriakoff had therefore arranged that a river pilot should meet the *Lena* at the north point of the delta, and had through Mr. Kolesoff negotiated with



THE STEAMER "LENA."

him an elaborate contract. But the pilot celebrated the receipt of the large sum of money he received by getting thoroughly intoxicated, and while in that state he broke one of the bones of the fore-arm. He was thus unable ever to reach the appointed rendezvous, and Johannesen was allowed to manage his little steamer as best he could.

After the *Lena* had parted with the *Vega* during the night between the 27th and 28th August, she steamed towards land, and came the same day to the northernmost cape of the Lena delta, situated in $73^{\circ} 47' N. L.$ ² It was here that the pilot's landmark was to have been erected, but there was no pilot here. After sailing backwards and forwards for some time in his attempts to enter the river, Johannesen determined to search for the easternmost arm of the delta, which, on the maps, is drawn as being very broad, and also appears to have been made use of by the vessels of "the great northern expeditions." On the 1st September he anchored in a bay on the mainland in the neighbourhood of the Bykhov mouth, whence on the 3rd September, at 2.30 a.m., he continued his course up the river, but by 10 o'clock the *Lena* was aground, and it was not until the 7th September that the delta was finally passed, and the *Lena* steamed in the river proper, where the fairway became considerably better. In the afternoon of the 8th they came to a village, Bulun. Impatient to proceed, and supposing that it was inhabited wholly by "Asiatics,"² Johannesen intended to pass it without stopping. But when the inhabitants saw the steamer they welcomed it with a salute from all the guns that could be got hold of in haste.³ The *Lena* then anchored. Two Crown officials and a priest came on board, and the latter performed a thanksgiving service.

Even at that remote spot on the border of the *tundra* the Asiatic comprehended very well the importance of vessels from the great oceans being able to reach the large rivers of Siberia. At nine in the morning the *Lena* continued her voyage up the river with the priest and the Crown officials on board, but they had soon to be landed, because in their joy they had become dead drunk. On the 13th September Shigansk was reached, and samples of the coal found there were taken on board, but these

¹ According to Johannesen's determination. On Wrangel's map the latitude of this cape is given as $73^{\circ} 30'$. Johannesen found the longitude to be $125^{\circ} 31'$ instead of 127° .

² A common name used in Siberia for all the native races.

³ This has been incorrectly interpreted as if they shot at the vessel.

proved unserviceable, and on the 21st September the *Lena* reached Yakutsk. The first vessel which, coming from the ocean, reached the heart of Siberia was received with great goodwill and hospitality, both by the authorities and the common people. But when Johannesen did not find here Siribiakoff's representative,



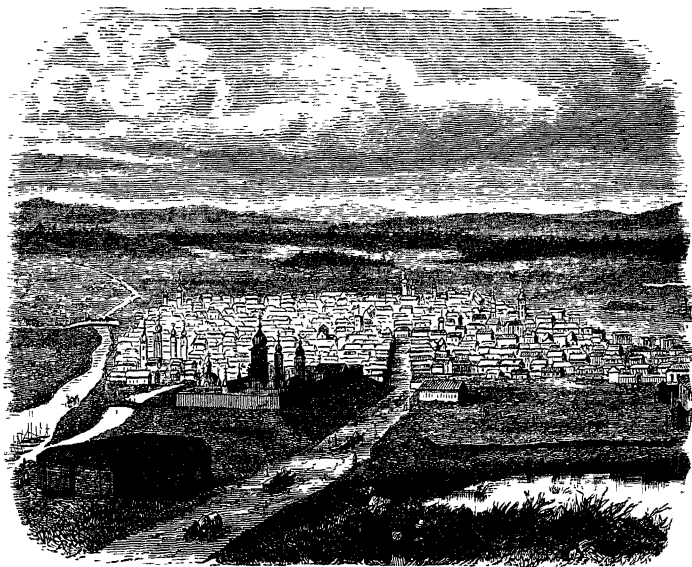
YAKUTSK IN THE SEVENTEENTH CENTURY.

(After Witsen.)

Kolesoff, he continued his voyage up the river, until, on the 8th October, he came to the village Nyaskaya, 140 miles from Vitim, in about 60° N. L. Here he turned back to Yakutsk and laid up the steamer in winter quarters a little to the south of that town.

Both the *Fraser* and *Express* and the *Lena* had thus fully answered the purposes intended before the departure of the expedition, and their voyages will always form an important link in the chain of enterprise through which navigation in the Siberian Polar Sea has been opened.

In order to give an idea of the influence which this sea-route



YAKUTSK IN OUR DAYS.

(After a recent Russian drawing.)

may have on the commerce of the world, and the new source of fortune and prosperity which thereby may be rendered accessible to millions, I shall in a few words give an account of the nature of the territory which by means of this sea-communication will be brought into contact with the old civilised countries of Europe.

If we take Siberia in its widest sense, that is to say, if we include under that name not only Siberia proper, but also the parts of High Asia which lie round the sources of the great Siberian rivers, this land may very well be compared in extent, climate, fertility, and the possibility of supporting a dense population, with America north of 40° N. L. Like America, Siberia is occupied in the north by woodless plains. South of this region, where only the hunter, the fisher, and the reindeer nomad can find a scanty livelihood, there lies a widely extended forest territory, difficult of cultivation, and in its natural conditions, perhaps, somewhat resembling Sweden and Finland north of 60° or 61° N. L. South of this wooded belt, again, we have, both in Siberia and America, immeasurable stretches of an exceedingly fertile soil, of whose power to repay the toil of the cultivator the grain exports during recent years from the frontier lands between the United States and Canada have afforded so striking an evidence. There is, however, this dissimilarity between Siberia and America, that while the products of the soil in America may be carried easily and cheaply to the harbours of the Atlantic and the Pacific, the best part of Siberia, that which lies round the upper part of the courses of the Irtysh-Ob and the Yenisei, is shut out from the great oceans of the world by immense tracts lying in front of it, and the great rivers which in Siberia cross the country and appear to be intended by nature to form not only the arteries for its inner life, but also channels of communication with the rest of the world, all flow towards the north and fall into a sea which, down to the most recent times, has been considered completely inaccessible.

Of these rivers the double river, Ob-Irtysh with its numerous affluents, waters an area of more than 1,300,000 English square miles, the Yenisei-Angara, not quite 1,070,000, and the Lena, somewhat over 841,000.¹ As the map of the river system of

¹ In order not to write without due examination about figures which have been written about a thousand times before, I have, with the help of Petermann's map of North and Middle Asia in Stieler's Hand-Atlas,



After A. Petermann's Map of North and Middle Asia in Steiers Hand-Atlas

Siberia, which accompanies this work, shows, but a small part of these enormous territories lies north of the Arctic Circle, and only very inconsiderable portions of it are occupied by woodless *tundra*, which is explained by the fact that the greater part of the coast-land bordering on the Arctic Ocean is drained by small rivers of its own, and therefore cannot be considered to belong to the river territories now in question. If we draw the northern boundary of the land that may be cultivated with advantage at 60° N. L., there remains a cultivable area of two millions English square miles. Perhaps a third part of this is occupied by rocky country which is wooded, and probably capable of being cultivated only with considerable difficulty; but the rest consists for the most part of easily cultivated grassy plains, with little wood, and covered with the most luxuriant vegetation. The soil, in many places resembling the black earth or *chernomem* of Russia, rewards with abundant harvests even the slightest labour of cultivation. Notwithstanding this, these regions now support only an exceedingly sparse population, but many, many millions may without difficulty find their subsistence there when once cultivation has developed the rich natural resources of the country.

It is a circumstance specially fortunate for the future development of Siberia that its three great rivers are already navigable for the greater part of their course. The Ob is navigable from Biisk (52½° N. L.), and the Irtysh at least from Semipalitinsk (50° 18' N. L.). The Yenisei, again, which, after leaving the region of its sources in China, crosses with its two main arms the whole of Siberia from south to north, from the forty-sixth to the seventy-third degree of latitude, and thus traverses a territory which corresponds in length to the distance between Venice and the North Cape, or between the mouth of the Mississippi and

calculated the extent of the areas of the Siberian rivers, and found them to be :—

					Square miles
River	area of the	Ob (with the Tas)	...	...	1,330,000
"	"	" Yenisei	...	...	1,047,000
"	"	" Lena	...	...	925,000

Of these areas about 2,000,000 square miles lie south of 60° N. L.

the north part of Lake Winnipeg, and is already navigable from the sea to Yeniseisk. To this town goods are already transported *down* both the main arms from Minusinsk and the region of Lake Baikal. It is said that the Angara might be made quite navigable during its whole course at an expenditure trifling in comparison with the advantages that would thus be gained, as well as its continuation, the Selenga, in its lower part between the Chinese frontier and Lake Baikal. In this way a river route would be opened for the conveyance of the products of North China and South Siberia to a sea which an ordinary steamer would cross in five or six days to the White Sea or the North Cape. A similar communication with the Atlantic may be opened on the double river Ob-Irtish with Western Siberia and High Asia as far as to Chinese Jungaria, where the Irtish begins its course as a small river, the Black Irtish, which falls into Lake Saisan, and rises south of the Altai Mountains in the neighbourhood of the Selenga, the source-river of the Yenisei. At several places the river territories of the Ob and the Yenisei nearly join through affluents, which rise so close to each other that the two river systems might easily be connected by canals. This is also the case with the affluents of the Yenesei and the Lena, which at many places almost meet, and the Lena itself is, according to Latkin's statement, navigable from the village of Kochuga to the sea. We see from this how wonderfully advantageous is the natural system of interior communication which Siberia possesses, and at the same time that a communication by sea between this country and the rest of the world is possible only by the Arctic Ocean. It is on this that the enormous importance of the navigation of the Siberian Polar Sea depends. If this can be brought about, Siberia, with an inconsiderable expenditure in making canals, will not only become one of the most fortunate countries of the globe in respect of the possibility of the cheap transport of goods, but the old proposal of a north-eastern commercial route to China may even become a reality. If, on the other hand, navigation on the Polar Sea be not brought about, Siberia will long remain what it is at present—a land rich in raw materials, but poor in all that is required for the

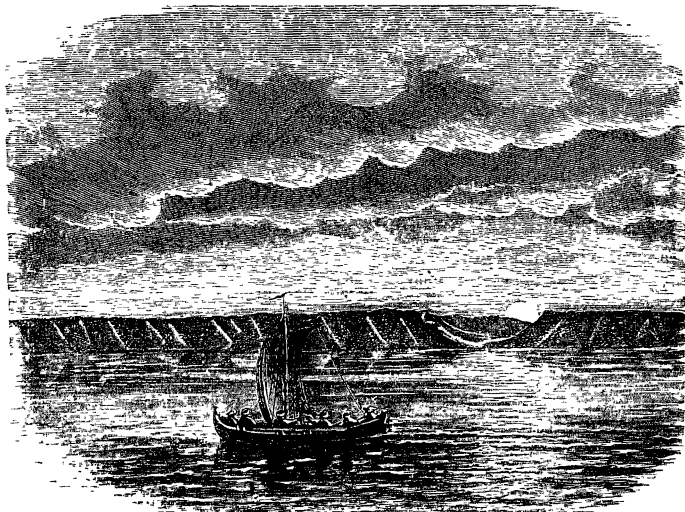
convenience and comfort with which the civilised man in our days can with difficulty dispense.

Many perhaps believe that the present want of commercial communication may be removed by a railway running across Russia and Southern Siberia. But this is by no means the case. On the contrary, communication by sea is an indispensable condition of such a railway being profitable. For it can never be proposed to carry by rail the products of the forest or the field over the stretch of 1,800 to 3,000 miles which separates the fertile river territory of the Ob-Irtish from the nearest European port. Even if we suppose that the railway freight, inclusive of all costs, could be reduced to less than a farthing the ton, it would in any case rise between the grain regions of Siberia and a harbour on the Baltic, to from 4*l.* to nearly 7*l.* per ton. So high a freight, with the costs of loading in addition, none of the common products of agriculture or forestry can stand, as may easily be seen if we compare this amount with the prices current in the markets of the world for wheat, rye, oats, barley, timber, &c. But if the Siberian cannot sell his raw products, the land will continue to be as thinly peopled as it is at present, nor can the sparse population which will be found there procure themselves means to purchase such products of the industry of the present day as are able to bear long railway carriage. In the absence of contemporaneous sea-communication the railway will therefore be without traffic, the land such as it is at present, and the unprosperous condition of the European population undiminished.

In order to give the reader an idea of the present natural conditions, and the present communication on a Siberian river, I shall, before returning to the sketch of the voyage of the *Vega*, give some extracts from notes made during my journey up the Yenesei in 1875, reminding the reader, however, that the natural conditions of the Ob-Irtish and the Lena differ considerably from those of the Yenisei, the Ob-Irtish flowing through lower, more fertile, and more thickly peopled regions, the Lena again through a wilder, more beautiful, but less cultivated country.

When we travel up the river from Port Dickson, the broad

sound between Sibriakoff's Island and the mainland is first passed, but the island is so low that it is not visible from the eastern bank of the river arm which is usually followed in sailing up or down the river. The mainland, on the other hand, is at first high-lying, and in sailing along the coast it is possible to distinguish various spurs of the range of hills, estimated to be from 500 to 650 feet high, in the interior. These are free of



RIVER VIEW ON THE YENISEI.
(From a drawing by A. N. Lundstrom)

snow in summer. A little south of Port Dickson they run to the river bank, where they form a low rock and rocky island projecting into the river, named after some otherwise unknown Siberian Polar trapper, Yefremov Kamen.

A short distance south of Yefremov Kamen begins the veritable *tundra*, a woodless plain, interrupted by no mountain heights, with small lakes scattered over it, and narrow valleys crossing

it, which often make an excursion on the apparently level plain exceedingly tiresome. As is the case with all the other Siberian rivers running from south to north,¹ the western strand of the Yenisei, wherever it is formed of loose, earthy layers, is also quite low and often marshy, while on the other hand the eastern strand consists of a steep bank thirty-three to sixty-six feet high, which north of the limit of trees is distributed in a very remarkable way into pyramidal pointed mounds. Numerous shells of crustacea found here, belonging to species which still live in the Polar Sea, show that at least the upper earthy layer of the *tundra* was deposited in a sea resembling that which now washes the north coast of Siberia.

The *tundra* itself is in summer completely free of snow, but at a limited depth from the surface the ground is continually frozen. At some places the earthy strata alternate with strata of pure, clear ice. It is in these frozen strata that complete carcasses of elephants and rhinoceroses have been found, which have been protected from putrefaction for hundreds of thousands of years. Such *finds*, however, are uncommon, but on the other hand single bones from this primeval animal world occur in rich abundance, and along with them masses of old drift-wood, originating from the Mammoth period, known by the Russian natives of Siberia under the distinctive name of "Noah's wood." Besides there are to be seen in the most recent layer of the Yenesei *tundra*, considerably north of the present limit of actual trees, large tree-stems with their roots fast in the soil, which show that the limit of trees in the Yenesei region, even during our geological period, went further north than now, perhaps as far, in consequence of favourable local circumstances, it now goes on the Lena.

¹ It is the general rule that where rivers flow through loose, earthy strata in a direction deviating considerably from that of the parallels of latitude, the right bank, when one stands facing the mouth of the river, is high, and the left low. The cause of this is the globular form of the earth and its rotation, which gives rivers flowing north a tendency towards the east, and to rivers flowing south a tendency to the west. This tendency is resisted by the bank, but it is gradually eaten into and washed away by degrees, so that the river bed, in the course of thousands of years, is shifted in the direction indicated.

On the slopes of the steep *tundra* bank and in several of the *tundra* valleys there is an exceedingly rich vegetation, which only sixty miles south of Yefremov Kamen, forms actual thickets of flowering plants, while the *tundra* itself is overgrown with an exceedingly scanty carpet, consisting more of mosses than of grasses. Salices of little height go as far north as Port Dickson (73° 30' N. L.), the dwarf birch (*Betula nana*, L.) is met with, though only as a bush creeping along the ground, at Cape Schaitanskoi (72° 8' N. L.); and here in 1875, on the ice-mixed soil of the *tundra*, we gathered ripe cloudberries. Very luxuriant alders (*Alnaster fruticosus*, LEDEB.) occur already at Mesenkin (71° 28' N. L.), and the Briochov Islands (70° to 71° N. L.) are in several places covered with rich and luxuriant thickets of bushes. But the limit of trees proper is considered to begin first at the great bend which the river makes in 69° 40' N. L., a little north of Dudino. Here the hills are covered with a sort of wood consisting of half-withered, grey, moss-grown larches (*Larix sibirica*), which seldom reach a height of more than twenty-two to thirty feet, and which much less deserve the name of trees than the luxuriant alder bushes which grow nearly 2° farther north. But some few miles south of this place, and still far north of the Arctic Circle, the pine forest becomes tall. Here begins a veritable forest, the greatest the earth has to show, extending with little interruption from the Ural to the neighbourhood of the Sea of Ochotsk, and from the fifty-eighth or fifty-ninth degree of latitude to far north of the Arctic Circle, that is to say, about six hundred miles from north to south, and perhaps four times as much from east to west. It is a primeval forest of enormous extent, nearly untouched by the axe of the cultivator, but at many places devastated by extensive forest fires.

On the high eastern bank of the Yenisei the forest begins immediately at the river bank. It consists principally of pines: the cembra pine (*Pinus Cembra*, L.), valued for its seeds, enormous larches, the nearly awl-formed Siberian pine (*Pinus sibirica*, LEDEB.), the fir (*Pinus obovata*, TURCZ.), and scattered trees of the common pine (*Pinus sylvestris*, L.). Most of these

already north of the Arctic Circle reach a colossal size, but in such a case are often here, far from all forestry, grey and half-dried up with age. Between the trees the ground is so covered with fallen branches and stems, only some of which are fresh, the others converted into a mass of wood-mould held together only by the bark, that there one willingly avoids going forward on an unbroken path. If that must be done, the progress made is small, and there is constant danger of breaking one's bones in the labyrinth of stems. Nearly everywhere the fallen stems are covered, often concealed, by an exceedingly luxuriant bed of mosses, while on the other hand tree-lichens, probably in consequence of the dry inland climate of Siberia, occur sparingly. The pines, therefore, want the shaggy covering common in Sweden, and the bark of the birches which are seen here and there among the pines is distinguished by an uncommon blinding whiteness.

The western bank of the Yenisei consists, like the innumerable islands of the river, for the most part of low-lying and marshy stretches of land, which at the season of the spring floods are overflowed by the river and abundantly manured with its mud. In this way there is formed here a fertile tract of meadow covered partly with a grassy turf untouched by the scythe, partly with a very peculiar bush vegetation, rising to a height of eight metres, among which there are to be found a number of families of plants well known by us in Sweden, as *Impatiens*, *Urtica*, *Sonchus*, *Heracleum*, &c., but in gigantic forms unknown at home. Often a dense thicket of a willow (*Salix vitellina*, L.), whose straight, branchless stems resemble at a distance the bamboo woods of the south, alternates with level, grassy carpets of a lively green and small streams in such a way as gives the whole the appearance of the most smiling park carefully kept free of fallen branches and dry grass. It is the river water which in spring has played the gardener's part in these parks, seldom trodden by the foot of man and endlessly rich in the most splendid greenery. Near the river there are also to be found carpets of a uniform green, consisting of a short kind of *Equisetum*, unmixed with any other plants, which forms a "gazon," to which no nobleman's

country seat can show a match. The drawback is, that a stay in these regions during summer is rendered nearly impossible by the enormous number of mosquitoes with which the air is infested.

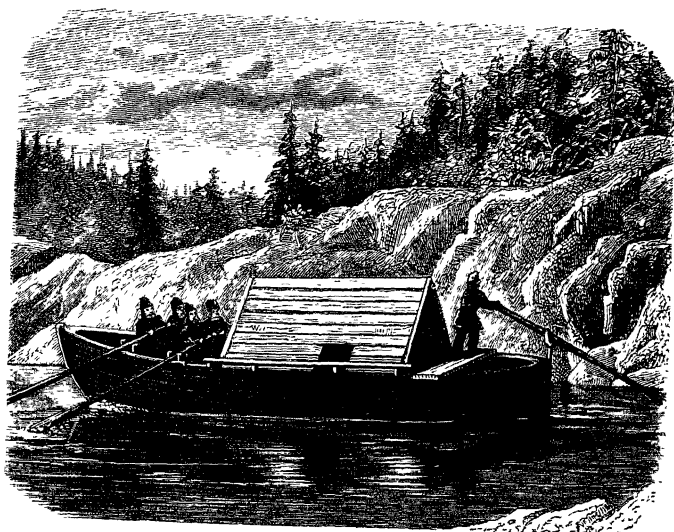
A table drawn up by Dr. ARNELL, to be found in *Redogörelse för de svenska expeditionerna till mynningen af Jenisej år 1876*,¹ shows the distribution of the most important varieties of trees. From it we see that on the Yenesei the birch (*Betula odorata*, BECHST.), the fir (*Pinus obovata*, TURCZ.), the larch (*Pinus larix*, L.), and the juniper (*Juniperus communis*, L.), go to 69° 35' N. L. (that is to say to the latitude of Tromsøe); the sallow (*Salix caprea*, L.), to 68° 55'; the bird's cherry (*Prunus padus*, L.), and the Siberian pine (*Pinus sibirica*, LEDEB.), to 66° 30'; the aspen (*Populus tremula*, L.) to 65° 55' (the latitude of Haparanda); the pine (*Pinus sylvatica*, L.) to 65° 50', &c.

In the middle of the forest belt the wood appears to cover the whole land without interruption, there being, unless exceptionally, no open places. But towards the north the forest passes into the treeless *tundra* through bare spots occurring here and there, which gradually increase, until trees grow only in valleys and sheltered places, and finally disappear completely. Similar is the passage of the forest to treeless regions (steppes), which at first are here and there bestrewn with more or less detached groups of broad-leaved trees, until they wholly disappear, and the land forms an endless plain, out of whose fertile soil the warm summer sun calls forth a great variety of luxuriant vegetable forms, whose many-hued flowers, often large and splendid, clothe the fields with the richest splendour of colour. Here is the true homeland of many of the show-plants in the flower-gardens of Europe, as, for instance, the peony, the Siberian robinia, the blue iris, &c.

If the Siberian wooded belt forms the most extensive forest in the world, this flower-steppe forms the world's greatest cultivable field, in all probability unequalled in extent and fertility. Without manure and with an exceedingly small amount of labour expended on cultivation, man will year by

¹ *Bihang* #22, *Vet. Akad. Handl.* Bd. iv. No. 11, p. 42.

year draw forth from its black soil the most abundant harvests. For the present, however, this land, with its splendid capabilities for cultivation, has an exceedingly scanty population; and this holds good in a yet higher degree of the forest belt, which is less susceptible of cultivation. At a considerable distance from the rivers it is for the most part an unknown land, where the European seldom or never sets his foot, and where only the



SIBERIAN RIVER BOAT.

Used by the Norwegian traveller Chr. Hansteen on the river Angara.

native nomad or hunter wanders about. These forests, however, are by no means so rich in game as might be expected, perhaps because the mosquitoes in summer are unendurable by warm-blooded animals.

The main population in the forest belt consists of native nomad or hunting tribes, of which Samoyeds, Ostyaks, Tungus, and Yakuts are the most numerous. Only along the rivers do we

find Russian villages and peasant settlements, placed there for trading with the natives, for fishing, and at some places for washing gold. Not till we come to the middle of the country is the Russian population more numerous; here it spreads out in a broad belt over the whole of the immense expanse between the Ural and the Angara.

In the farthest north the Russian dwelling-places consist of single cabins built of logs or planks from broken-up lighters,¹ and having flat, turf-covered roofs. Such carvings and ornaments as are commonly found on the houses of the well-to-do Russian peasant, and whose artistic outlines indicate that the inhabitants have had time to think of something else than the satisfaction of the wants of the moment, are here completely wanting; but further south the villages are larger, and the houses finer, with raised roofs and high gables richly ornamented with wood-carvings. A church, painted in bright colours, generally shows that one of the inhabitants of the village has become rich enough to be at the expense of this ornament to his native place. The whole indicates a degree of prosperity, and the interiors of the houses, if we except the cockroaches, which swarm everywhere, are very clean. The walls are ornamented with numerous, if not very artistic photographs and lithographs. Sacred pictures, richly ornamented, are placed in a corner, and before them hang several small oil-lamps, or small wax-lights, which are lighted on festive occasions. The sleeping place is formed of a bedstead near the roof, so large that it occupies a half or a third of the room, and at such a height from the floor that one can stand upright under it. There a tropical heat commonly prevails, the occupant of the bed accordingly enjoying an almost constant sweat-bath, which does not prevent him from going out immediately into the open air at a temperature at which mercury freezes. Food is cooked in large baking ovens, which are fired daily for

¹ Provisions and wares intended for trade with the natives are transported on the Yenisei, as on many other Siberian rivers, down the stream in colossal lighters, built of planks like logs. It does not pay to take them up the river again, on which account, after their lading has been taken out of them, they are either left on the bank to rot or broken up for the timber.

that purpose, and at the same time heat the cabin. Fresh bread is baked every day, and even for the poor a large tea-urn (*samovar*) is an almost indispensable household article. The foreigner is certain to receive a hearty and friendly welcome when he crosses the threshold, and if he stays a short time in the cabin he will generally, whatever time of the day it be, find himself drinking a glass of tea with his host. The dress everywhere closely resembles the Russian: for the rich, wide velvet trousers stuck into the boots, a shirt showily embroidered with silver thread, and a large caftan often lined with fur; for the poor, if not too ragged, the same cut, but the cloth inferior, dirty and torn. During winter, however, for going out of doors, the Samoyed *pesk* is said to be common to high and low, Russian and native, settled and nomad.

In my journey up the Yenisei in 1875 I met with only a few persons in these regions who had been exiled thither for political reasons, but on the other hand very many exiled criminals of the deepest dye—murderers, thieves, forgers, incendiaries, &c. Among them were also some few Fins and even a Swede, or at least one, who, according to his own statement in broken Swedish, had formerly served in the King's Guard at Stockholm. Security of person and property was in any case complete, and it was remarkable that there did not appear to be any proper distinction of caste between the Russian-Siberian natives and those who had been exiled for crime. There appeared even to be little interest in ascertaining the crime—or, as the customary phrase appears to be here, the “misfortune”—which caused the exile. On making inquiry on this point I commonly got the answer, susceptible of many interpretations, “for bad behaviour.” We found a peculiar sort of criminal colony at Selivaninskoi, a very large village situated on the eastern bank of the Yenisei, in about the latitude of Aavasaksa. My journal of the expedition of 1875 contains the following notes of my visit to this colony.

The orthodox Russian church, as is well known, is tolerant towards the professors of foreign religions—Lutherans, Catholics, Jews, Mohammedans, Buddhists, Shamans, &c.; but, on the other hand, in complete correspondence with what took place in former

times within the Protestant world, persecutes sectaries within its own pale with temporal punishments here upon earth and with threatenings of eternal in another world. Especially in former times a great many sectaries have been sent to Siberia, and therefore there are sometimes to be found there peculiar colonies enjoying great prosperity, exclusively inhabited by the members

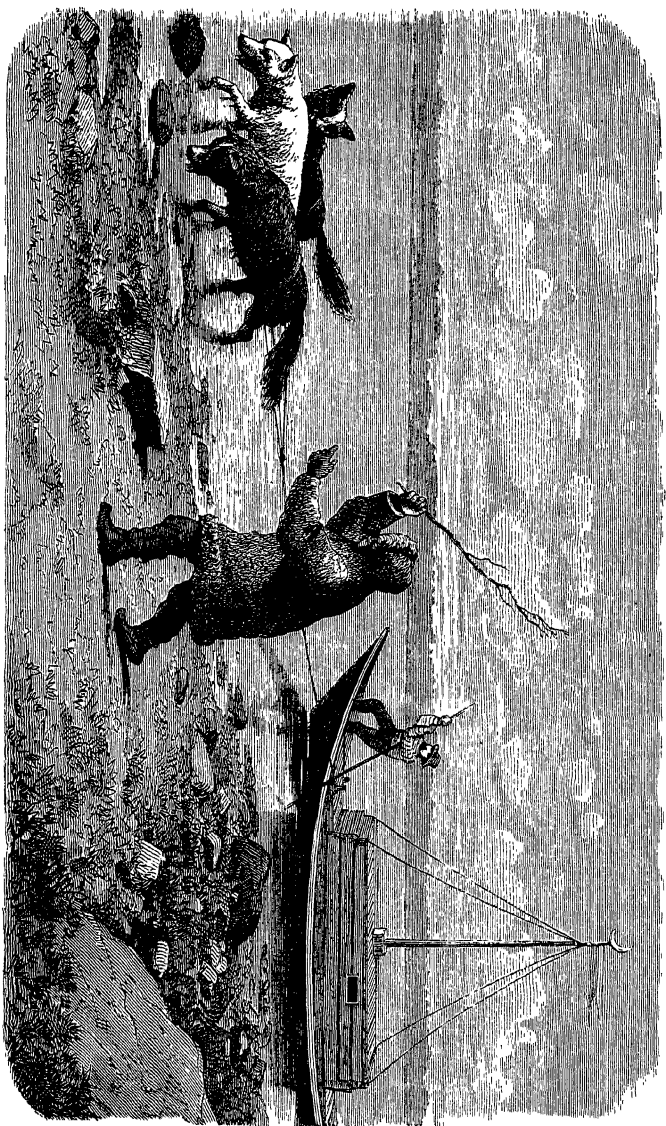


OSTYAK TENT.
(After a Photograph)

of a certain sect. Such is the Skopt colony at Selivaninskoi, in connection with which, however, it may be remarked that the nature of the religious delusion in this case accounts for the severity of the law or the authorities. For, on the ground of a text in the Gospel of Matthew interpreted in a very peculiar way, all Skoptzi subject themselves to a mutilation, in consequence of which the sect can only exist by new proselytes ; and remarkably

enough, these madmen, notwithstanding all persecution, or perhaps just on that account, actually still gain followers. A large number of the Skoptzi were Fins from Ingermanland, with whom I could converse without difficulty. They had, through industry and perseverance, succeeded in creating for themselves a certain prosperity, were hospitable and friendly, and bore their hard fate with resignation. They would not themselves kill any warm-blooded animal, for it was "a sin to kill what God had created;" which did not hinder them from catching and eating fish, and from selling to us, who in any case were lost beings, a fine fat ox, on condition that our own people should slaughter it. Their abstinence from some kinds of animal food had besides the good result of inducing them to devote themselves to the cultivation of the soil. Round about their cabins accordingly there were patches of land growing potatoes, turnips, and cabbage, which at least that year yielded an abundant crop, though lying under the Arctic circle. Farther south such plots increase in size, and yield rich crops, at least, of a very large potato. There is no proper cultivation of grain till we come to Sykobatka, situated in 60° N. L., but in a future, when forests and mosses are diminished, a profitable agriculture will be carried on far to the northward.

Along with the dwellings of the Russians, the tents of the natives, or, as the Russians call them, "the Asiatics," are often to be met with. They have the same shape as the Lapp "kota." The Samoyed tent is commonly covered with reindeer skins, the Ostyak tent with birch bark. In the neighbourhood of the tent there are always large numbers of dogs, which during winter are employed for general carrying purposes, and in summer for towing boats up the river—a means of water transport which greatly astonished the Norwegian sailors with whom I travelled up the river in 1875. To see people travelling in a boat drawn by dogs appeared to them more remarkable than the Kremlin of Moscow, or the bells of Kiev. For such a journey a sufficient number of dogs are harnessed to a long line, one end of which is fastened to the stem of the boat. The dogs then go along the level bank, where they make actual footpaths. The boat being



TOWING WITH DOGS ON THE YENESSEI
The boat *Luna* with the Swedish Land Expedition of 1876 on board. (After a drawing by Hj Thel.)

of light draught is kept afloat at a sufficient distance from land partly by means of the rudder which is managed by a person sitting in the stem of the boat, and partly by poling from the fore. Small boats are often hollowed out of a single tree-stem, and may notwithstanding, thanks to the size which some of the



FISHING BOATS ON THE OB.
(After a Photograph.)

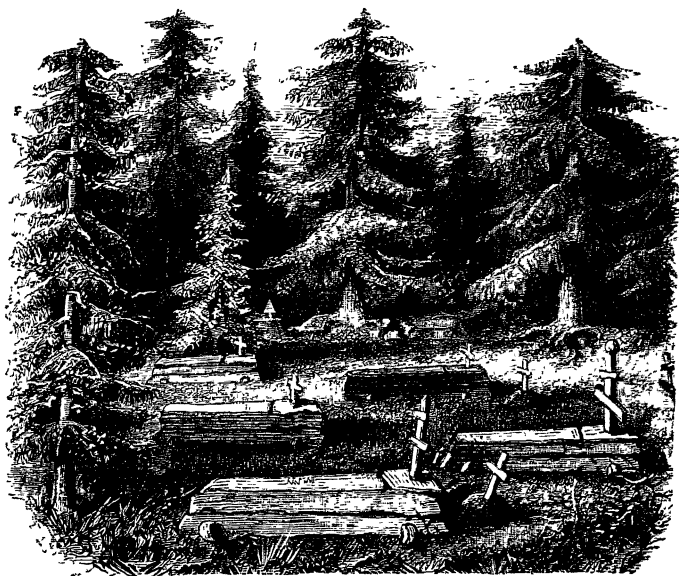
pinces attain in those regions, be very roomy, and of a very beautiful shape. The dogs strongly resemble the Eskimo dogs in Greenland, which are also used as draught animals.

Most of the natives who have come into close contact with the Russians are said to profess the Christian religion. That many heathen customs, however, still adhere to them is shown, among

other things, by the following incident: At a *simovie* where we landed for some hours on the 16th Sept., we found, as is common, a burying-place in the forest near the dwelling-houses. The corpses were placed in large coffins above ground, at which almost always a cross was erected. In one of the crosses a sacred picture was inserted, which must be considered a further proof that a Christian rested in the coffin. Notwithstanding this, we found some clothes, which had belonged to the departed, hanging on a bush beside the grave, together with a bundle containing food, principally dried fish. At the graves of the richer natives the survivors are even said to place along with food some rouble notes, in order that the departed may not be altogether without ready money on his entrance into the other world.

Right opposite the village Nasimovskoi is a gold-digger's deserted "residence," named Yermakova after the first conqueror of Siberia. The building owed its origin to the discovery of sand-beds rich in gold, occupying a pretty extensive area east of the Yenisei, which for a time had the repute of being the richest gold territory in the world. Here in a short time enormous fortunes were made; and accounts of the hundreds of poods which one or another yearly reaped from the sand-beds, and the fast reckless life led by those to whom fortune dealt out the great prizes in the gold-digging lottery, still form a favourite topic of conversation in the region. A rise in the value of labour and a diminished production of the noble metal have, however, since led to the abandonment of a large number of the diggings that formerly were most productive; others now scarcely pay the expense of the working. Many of the gold-diggers who were formerly rich, in the attempt to win more have been impoverished, and have disappeared; others who have succeeded in retaining their "pood of gold"—that is the mint unit which the gold-diggers prefer to use in their conversation—have removed to Omsk, Krasnojarsk, Moscow, Petersburg, Paris, &c. The gold-diggers' residences stand, therefore, now deserted, and form on the eastern bank of the river a row of half-decayed wooden ruins surrounded by young trees, after which in no long time only the tradition of the former period of prosperity will be

found remaining. In one respect indeed the gold-diggers have exerted a powerful influence on the future of the country. For it was through them that the first pioneers were scattered in the wilderness, the first seed sown of the cultivation of the region.



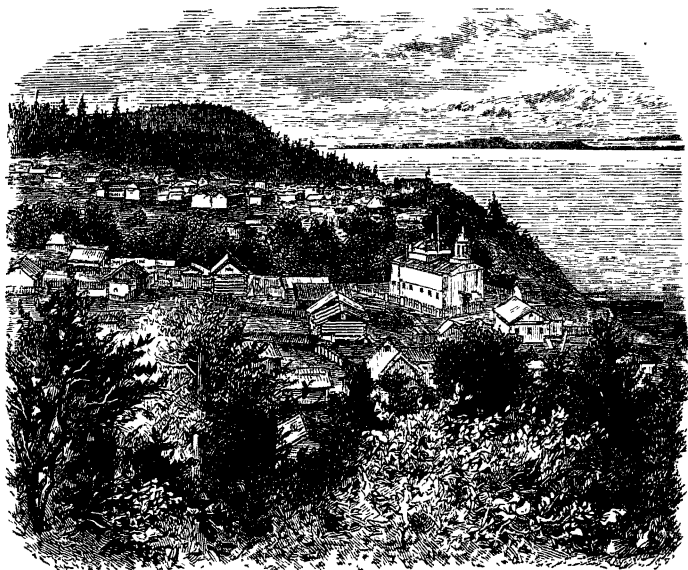
GRAVES IN THE PRIMEVAL FOREST OF SIBERIA
(After a drawing by H. J. Théel)

In 1875 there were only two steamers on the Yenisei. These were neither passenger nor cargo boats, but rather movable commercial stores, propelled by steam. The fore-saloon formed a shop provided with a desk, and shelves, on which were to be seen cloths, iron wares, guns, ammunition, tobacco, tea, matches, sugar, brightly coloured copper engravings or lithographs, &c. In the after-saloon was enthroned, among brandy casks, purchased

furs, and other precious or delicate wares, he who had the command on board, a kind and friendly merchant, who evidently did not concern himself much with the work of the sailors, but rather with trade and the making of bargains, and who was seldom called by the crew captain (*kapitan*), but generally master (*hosain*). After the steamer, or floating commercial store, there was towed one or two *lodjas*, which served as magazines, in which meal and salt and other heavy goods were stored, the purchased fish were salted and looked after, fresh bread baked for the numerous crew, &c. And as there was not a single jetty to be found the whole way between Yeniseisk and the sea, both the steamer and the *lodjas*, in order to be able to load and deliver goods at any point, had a large number of boats and lighters in tow. No place was set apart for passengers, but travellers were received in a friendly and hospitable manner when they came on board, where they were then allowed to look out for themselves as best they could. The nautical command was held by two mates or pilots of a stately and original appearance, who, clad in long caftans, sat each in his watch on a chair at the wheel, generally without steering, mostly smoking a cigarette made of coarse paper, and, with the most careless appearance in the world, exchanging jests with those who were going down the river. The prohibition of taking away the attention of the steersman from his work by conversation was thus not in force hereabouts. A man stood constantly in the fore, uninterruptedly testing the depth with a long pole. For in order to avoid the strong current of the main stream the course was always shaped as near the shore as possible, often so near that one could almost jump ashore, and my own Nordland boat, which was towed by the side of the steamer, was occasionally drawn over land. It will be seen from this of how light draught the steamer was.

Siberia, especially the river territory of the Yenisei and the Lena, possesses rich coal seams, which probably extend under considerable portions of the Siberian plain, but are yet unworked and have attracted little attention. The river steamers accordingly are fired, not with coal, but with wood, of which, if I remember right, 180 fathoms went to the voyage of the steamer *Alexander*

up the river. As the vessel could carry only a small portion of this quantity of wood at one time, frequent halts were necessary, not only for trading with the natives, but also for taking fuel on board. In addition to this, the weak engine, *although the safety valves were overloaded when necessary with lead weights*, was sometimes unable to make head with all the vessels in tow against



CHURCH VILLAGE ON A SIBERIAN RIVER.
(After a Photograph.)

a current which at some places was very rapid, and often in the attempt to find still water near the river bank the steamer ran aground, notwithstanding the continual "ladno" cry of the poling pilot standing in the fore. It made so slow progress on this account that the passage from Saostrovskoi to Yeniseisk occupied a whole month.

The two main arms into which the Yenisei is divided south of Yeniseisk are too rapid for the present Yenisei steamers to ascend them, while, as has been already stated, there is no difficulty in descending these rivers from the Selenga and the Baikal Lake on the one hand, and from the Minusinsk region abounding in grain on the other. The banks here consist, in many places, of high rocky ridges covered with fine forests, with wonderfully beautiful valleys between them, covered with luxuriant vegetation.

What I have said regarding the mode of travelling up the Yenisei refers to the year 1875, in which I went up the river accompanied by two Swedish naturalists and three Norwegian seamen. It was then by no means unknown, for scientific men such as HANSTEEN (1829), CASTRÉN (1846), MIDDENDORFF (winter journeys in 1843 and 1844), and SCHMIDT (1866), had travelled hither and communicated their observations to the scientific world in valuable works on the nature and people of the region. But the visits of the West-European still formed rare exceptions; no West-European commercial traveller had yet wandered to those regions, and into the calculations of the friendly masters of the Yenisei river steamers no import of goods from, or export of goods to, Europe had ever entered. All at once a new period seemed to begin. If the change has not gone on so fast as many expected, life here, however, is more than it was at one time, and every year the change is more and more noticeable. It is on this account that I consider these notes from the journey of 1875 worthy of being preserved.

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CHAPTER VII.

The New Siberian Islands—The Mammoth—Discovery of Mammoth and Rhinoceros mummies—Fossil Rhinoceros horns—Stolbovoi Island—Liakhoff's Island—First discovery of this island—Passage through the sound between this island and the mainland—Animal life there—Formation of ice in water above the freezing point—The Bear Islands—The quantity and dimensions of the ice begin to increase—Different kinds of sea-ice—Renewed attempt to leave the open channel along the coast—Lighthouse Island—Voyage along the coast to Cape Schelagskoi—Advance delayed by ice, shoals, and fog—First meeting with the Chukches—Landing and visits to Chukchi villages—Discovery of abandoned encampments—Trade with the natives rendered difficult by the want of means of exchange—Stay at Irkaipi—Onkilon graves—Information regarding the Onkilon race—Renewed contact with the Chukches—Kolyuchin Bay—American statements regarding the state of the ice north of Behring's Straits—The *Vega* beset.

AFTER the parting the *Lena* shaped her course towards the land ; the *Vega* continued her voyage in a north-easterly direction towards the New Siberian Islands.

These have, from the time of their discovery, been renowned among the Russian ivory collectors for their extraordinary richness in tusks and portions of skeletons of the extinct northern species of elephant known by the name of *mammoth*.

We know by the careful researches of the academicians PALLAS, VON BAER, BRANDT, VON MIDDENDORFF, FR. SCHMIDT, &c., that the mammoth was a peculiar northern species of elephant with a covering of hair, which, at least during certain seasons of the year, lived under natural conditions closely resembling those which now prevail in middle and even Northern Siberia. The extensive grassy plains and forests of North Asia were the proper home of

this animal, and there it must at one time have wandered about in large herds.

The same, or a closely allied species of elephant, also occurred in North America, in England, France, Switzerland, Germany, and North Russia. Indeed, even in Sweden and Finland inconsiderable mammoth remains have sometimes been found.¹ But while in Europe only some more or less inconsiderable remains of bones are commonly to be found, in Siberia we meet not only with whole skeletons, but also whole animals frozen in the earth, with solidified blood, flesh, hide, and hair. Hence we may draw the conclusion that the mammoth died out, speaking geologically, not so very long ago.

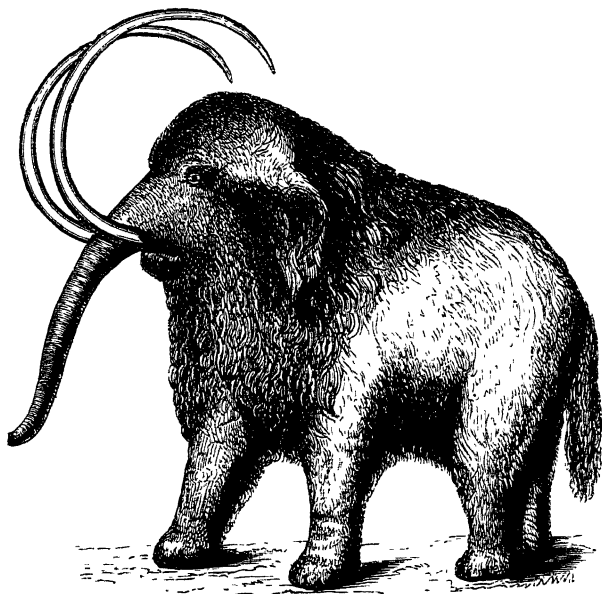
If the interpretation of an obscure passage in Pliny be correct mammoth ivory has, from the most ancient times, formed a valued article of commerce, which, however, was often mistaken for the ivory of living elephants and of the walrus. But portions of the skeleton of the mammoth itself are first described in detail by WITSEN, who during his stay in Russia in 1686 collected a large number of statements regarding it, and at least in the second edition of his work gives good drawings of the under jaw of a mammoth and the cranium of a fossil species of ox, whose bones are found along with the remains of the mammoth (WITSEN, 2nd edit. p. 746). The first mammoth tusk was brought to England in 1611, by JOSIAS LOGAN. It was purchased in the region of the Pechora, and attracted great attention, as appears from Logan's remark in a letter to Hakluyt, that one would not have dreamed to find such wares in the region of the Pechora (*Purchas*, iii. p. 546). As Englishmen at that time visited Moscow frequently, and for long periods, this remark appears to indicate that fossil ivory first became known in the capital of Russia some time after the conquest of Siberia.

The finds of mammoth tusks sufficiently well preserved to be used for carving are so frequent as to defy enumeration.

¹ Further information on this point is given by A. J. Malmgren in a paper on the occurrence and extent of mammoth-finds, and on the conditions of this animal's existence in former times (*Finska Vet.-Soc. Förhandl.* 1874—5).

Middendorff reckons the number of the tusks, which yearly come into the market, as at least a hundred pairs, whence we may infer, that during the years that have elapsed since the conquest of Siberia useful tusks from more than 20,000 animals have been collected.

The discovery of a mammoth-mummy is mentioned for the first



RESTORED FORM OF THE MAMMOTH.

After JUKES, *The Student's Manual of Geology*. Edinburgh, 1862.

time in detail in the sketch of a journey which the Russian ambassador EVERT YSSBRANTS IDES, a Dutchman by birth, made in 1692 through Siberia to China. A person whom Yssbrants Ides had with him during his journey through Siberia, and who travelled every year to collect mammoth ivory, assured him that he had once found a head of this animal in a piece of

frozen earth which had tumbled down. The flesh was putrefied, the neck-bone was still coloured by blood, and some distance from the head a frozen foot was found. The foot was taken to Turukhansk, whence we may infer that the find was made on the Yenisei.

The folk-lore of the natives regarding the mode of life of the mammoth under ground is given in still greater detail in J. B. MÜLLER'S *Leben und Gewonheiten der Ostiaken unter dem Polo arctico wohnende*, &c. Berlin, 1720 (in French in *Recueil de Voyages au Nord*, Amsterdam, 1731—38, Vol. VIII. p. 373). According to the accounts given by Müller, who lived in Siberia as a Swedish prisoner of war, the tusks formed the animal's horns. With these, which were fastened above the eyes and were movable, the animal dug a way for itself through the clay and mud, but when it came to sandy soil, the sand ran together so that the mammoth stuck fast and perished. Müller further states, that many assured him that they themselves had seen such animals on the other side of Beresovsk in large grottos in the Ural mountains (*loc. cit.* p. 382).

It was not until the latter half of the last century that a European scientific man had an opportunity of examining a similar find. In the year 1771 a complete rhinoceros, with flesh and hide, was uncovered by a landslip on the river Wilui in 64° N. L. Its head and feet are still preserved at St. Petersburg. All the other parts were allowed to be destroyed for want of means of transport and preservation.¹ What was taken away showed that this primeval rhinoceros (*Rhinoceros antiquitatis* Blumenbach) had been covered with hair and differed from all now living species of the same family, though strongly resembling them in shape and size.

Several finds of the carcasses of mammoths are on record, but we need only mention those of Middendorff and Schmidt. The former was made in 1843 on the bank of the river Taimur,

¹ P. S. Pallas, *De reliquiis animalium exoticorum per Asiam borealem repertis complementum* (*Novi commentarii Acad. Sc. Petropolitaneæ*, XVII. pro anno 1772, p. 576), and *Reise durch verschiedene Provinzen des Russische Reichs*, Th. III. St. Petersburg, 1776, p. 97.

under 75° N. L. ; the latter in 1866 on the Gyda *tundra*, west of the mouth of the Yenisei in $70^{\circ} 13'$ N. L. Middendorff arrived at the conclusion that the animal found by him had floated from more southerly regions to the place where it was found. Schmidt



SIBERIAN RHINOCEROS HORN
(Preserved in the Museum at St. Petersburg)

on the other hand found that the stratum which contained the mammoth rested on a bed of marine clay, containing shells of high northern species of crustacea which still live in the Polar Sea, and that it was covered with strata of sand alternating with beds, from a quarter to half a foot thick, of decayed remains

of plants, which completely correspond with the turf beds which are still formed in the lakes of the *tundra*. Even the very beds of earth and clay in which the bones, pieces of hide, and hair of the mammoth mummy were inclosed, contained pieces of larch, branches and leaves of the dwarf birch (*Betula nana*), and of two northern species of willow (*Salix glauca* and *herbacea*).¹ It appears from this that the climate of Siberia at the time when these mammoth-carcases were imbedded, was very nearly the same as at present, and as the stream in whose neighbourhood the find was made is a comparatively inconsiderable *tundra* river, lying wholly to the north of the limit of trees, there is no probability that the carcase drifted with the spring ice from the wooded region of Siberia towards the north. Schmidt, therefore, supposes that the Siberian elephant, if it did not always live in the northernmost parts of Asia, occasionally wandered thither, in the same way that the reindeer now betakes itself to the coast of the Polar Sea. VON BRANDT, VON SCHMALHAUSEN, and others, had besides already shown that the remains of food which were found in the hollows of the teeth of the Wilui rhinoceros consisted of portions of leaves and needles of species of trees which still grow in Siberia.²

A new and important find was made in 1877 on a tributary of the Lena, in the circle Werchojansk, in 69° N. L. For there was found an exceedingly well preserved carcase of a rhinoceros (*Rhinoceros Merckii*, Jaeg.), a different species from the Wilui rhinoceros examined by Pallas. However, before the carcase was washed away by the river, there had only been removed the hair-covered head and one foot.³ From the find Schrenck draws the conclusion that this rhinoceros belonged to a high-northern species, adapted to a cold climate, and living in, or at least

¹ Friedrich Schmidt, *Wissenschaftliche Resultate der zur Aufsuchung eines Mammuthcadavers ausgesandten Expedition* (Mém. de l'Acad. de St. Pétersbourg, Ser. VII. T. XVIII. No. 1, 1872).

² Brandt, *Berichte der preussischen Akad. der Wissenschaften*, 1846, p. 224. Von Schmalhausen, *Bull. de l'Acad. de St. Pétersbourg*, T. XXII. p. 291.

³ The find is described by Herr Czersky in the Transactions published by the East Siberian division of the St. Petersburg Geographical Society; and subsequently by Dr. Leopold von Schrenck in *Mém. de l'Acad. de St. Pétersbourg*, Ser. VII. T. XXVII. No. 7, 1880.

occasionally wandering to, the regions where the carcase was found. There the mean temperature of the year is now very low, the winter exceedingly cold ($-63^{\circ}2$ C. has been registered) and the short summer exceedingly warm. Nowhere on earth does the temperature show extremes so widely separated as here. Although the trees in winter often split with tremendous noise, and the ground is rent with the cold, the wood is luxuriant and extends to the neighbourhood of the Polar Sea, where besides, the winter is much milder than farther in the interior. With respect to the possibility of these large animals finding sufficient pasture in the regions in question, it ought not to be overlooked that in sheltered places overflowed by the spring inundations there are found, still far north of the limit of trees, luxuriant bush, whose newly-expanded juicy leaves, burned up by no tropical sun, perhaps form a special luxury for grass-eating animals, and that *even the bleakest stretches of land in the high north are fertile in comparison with many regions where at least the camel can find nourishment, for instance the east coast of the Red Sea.*

The nearer we come to the coast of the Polar Sea, the more common are the remains of the mammoth, especially at places where there have been great landslips at the river banks when the ice breaks up in spring. Nowhere, however, are they found in such numbers as on the New Siberian Islands. Here Hedenström in the space of a verst saw ten tusks sticking out of the ground, and from a single sandbank on the west side of Liakhoff's Island the ivory collectors had, when this traveller visited the spot, for eighty years made their best tusk harvest. That new finds may be made there year by year depends on the bones and tusks being washed by the waves out of the sandbeds on the shore, so that after an east wind which has lasted some time they may be collected at low water on the banks then laid dry. The tusks which are found on the coast of the Polar Sea are said to be smaller than those that are found farther south, a circumstance which possibly may be explained by supposing that, while the mammoth wandered about on the plains of Siberia, animals of different ages pastured in company, and that the

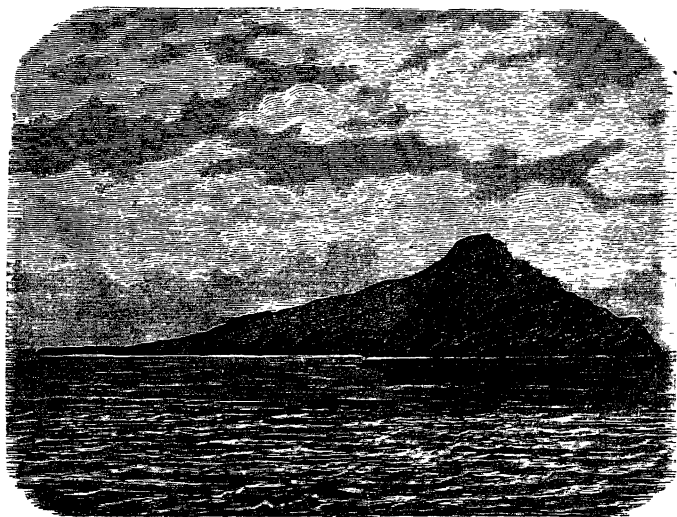
younger of them, as being more agile and perhaps more troubled by flies than the older, went farther north than these.

Along with bones of the mammoth there are found on the New Siberian Islands, in not inconsiderable numbers, portions of the skeletons of other animal forms, little known, but naturally of immense importance in ascertaining the vertebrate fauna which lived at the same time with the mammoth on the plains of Siberia; and the New Siberian group of islands is not less remarkable for the "wood-hills," highly enigmatical as to their mode of formation, which Hedenström found on the south coast of the northernmost island. These hills are two hundred feet high, and consist of thick horizontal sandstone beds alternating with strata of fissile bituminous tree stems, heaped on each other to the top of the hill. In the lower part of the hill the tree stems lie horizontally, but in the upper strata they stand upright, though perhaps not rootfast.¹ The flora and fauna of the island group besides are still completely unknown, and the fossils, among them ammonites with exquisite pearly lustre, which Hedenström brought home from the rock strata on Kotelnoi Island, hold out inducement to further researches, which ought to yield the geologist valuable information as to the former climate and the former distribution of land and sea on the surface of the globe. The knowledge of the hydrography of this region is besides an indispensable condition for judging of the state of the ice in the sea which washes the north coast of Asia. Here lies the single available starting-point for the exploration of the yet altogether unknown sea farther to the north, and from hills on the two northernmost islands Hedenström thought that across the sea to the north-west and north-east he saw obscure outlines of new land, on which no man had yet set his foot. All these circumstances confer on this group of islands an uncommon scientific and geographical interest, and therefore no long time can elapse until a scientific expedition be sent to these regions. Just for this reason I now desired, as a preparation

¹ Hedenström, *loc. cit.* p. 128. To find stranded driftwood in an upright position is nothing uncommon.

for a future voyage, to wander about here for a couple of days, partly on foot, partly by boat.

The air was calm, but for the most part clouded, the temperature as high as $+4^{\circ}$ C., the sea clear of ice, the salinity of the water 1.8 per cent. with a temperature of $+2^{\circ}$ to $+3^{\circ}$. At first we made rapid progress, but after having in the afternoon of the 28th August sighted the westernmost islands, Semenovskoi



STOLBOVOI ISLAND.

(After a drawing by O. Nordquist.)

and Stolbovoi, the sea became so shallow that for long stretches we were compelled to sail in twenty to twenty-three feet of water. Some very rotten ice, or rather ice sludge, was also met with, which compelled us to make tedious *détours*, and prevented the *Vega* from going at full speed.

The animal life was among the scantiest I had seen during my many travels in the Polar Seas. A few seals were visible. Of

birds we saw some terns and gulls, and even far out at sea a pretty large number of phalaropes—the most common kind of bird on the coast of the Asiatic Polar Sea, at least in autumn. Stolbovoi Island was, especially on the north side, high with precipitous shore-cliffs which afforded splendid breeding-places for looms, black guillemots and gulls. At all such cliffs there breed on Spitzbergen millions of sea fowl, which are met with out on the surrounding sea in great flocks searching for their food. Here not a single loom was seen, and even the number of the gulls was small, which indeed in some degree was to be accounted for by the late season of the year, but also by the circumstance that no colony of birds had settled on the rocky shores of the island.

The sea bottom consisted at certain places of hard packed sand, or rather, as I shall endeavour to show farther on, of *frozen* sand, from which the trawl net brought up no animals. At other places there was found a clay, exceedingly rich in *Idothea entomon* and *Sabinei* and an extraordinary mass of bryozoa, resembling collections of the eggs of mollusca.

It was not until the 30th of August that we were off the west side of Liakhoff's Island, on which I intended to land. The north coast, and, as it appeared the day after, the east coast was clear of ice, but the winds recently prevailing had heaped a mass of rotten ice on the west coast. The sea besides was so shallow here, that even at a distance of fifteen miles from land we had a depth of only twenty-six feet. The ice heaped against the west coast of the island did not indeed form any very serious obstacle to the advance of the *Vega*, but in case we had attempted to land there it might have been inconvenient enough, when the considerable distance between the vessel and the land was to be traversed in a boat or the steam launch, and it might even, if a sudden frost had occurred, have become a fetter, which would have confined us to that spot for the winter. Even a storm arising hastily might in this shallow water have been actually dangerous to the vessel anchored in an open road. The prospect of wandering about for some days on the island did not appear to me to outweigh the danger of the possible failure of the main object of

the expedition. I therefore gave up for the time my intention of landing. The course was shaped southwards towards the sound, of so bad repute in the history of the Siberian Polar Sea, which separates Liakhoff's Island from the mainland.

So far as we could judge at a distance from the appearance of the rocks, Stolbovoi consisted of stratified rocks, Liakhoff's Island, on the contrary, like the mainland opposite, of high hills, much shattered, probably formed of Plutonic stone-masses. Between these there are extensive plains, which, according to the statement by the land surveyor KHVONOFF, who, by order of the Czar visited the island in 1775, are formed of ice and sand, in which lie embedded enormous masses of the bones and tusks of the mammoth, mixed with the horns and skulls of some kind of ox, and with rhinoceros' horns. Bones of the whale and walrus are not mentioned as occurring there, but "long small screw-formed bones," by which are probably meant the tusks of the narwhal.¹

All was now clear of snow, with the exception of a few of the deeper clefts between the mountains. No traces of glaciers were visible, not even such small collections of ice as are to be found everywhere on Spitzbergen where the land rises a few hundred feet above the surface of the sea. Nor, to judge by the appearance of the hills, have there been any glaciers in former times, and this is certainly the case on the mainland. The northernmost part of Asia in that case has never been covered by such an ice-sheet as is assumed by the supporters of a general ice-age embracing the whole globe.

The large island right opposite to Sviatoinos was discovered in 1770 by LIAKHOFF, whose name the island now bears.

Liakhoff states the breadth of the sound between the mainland and the nearest large island at forty-five miles. On Wrangel's map again the breadth is not quite thirty-five. On the mainland side it is

¹ Martin Sauer, *An Account of a Geographical and Astronomical Expedition to the Northern parts of Russia by Commodore Joseph Billings*, London, 1802, p. 105. The walrus does not occur in the sea between the mouth of the Chatanga and Wrangel Land, and large whales are never seen at the New Siberian Islands, but during Hedenström's stay in these regions three narwhals were inclosed in the ice near the shore at the mouth of the Yana (*Otryvki o Sibiri*, p. 131).

bounded by a rocky headland projecting far into the sea, which often formed the turning point in attempts to penetrate eastwards from the mouth of the river Lena, and perhaps just on that account, like many other headlands dangerous to the navigator on the north coast of Russia, was called *Sviatoinos* (the holy cape), a name which for the oldest Russian Polar Sea navigators appears to have had the same signification as "the cape that can be passed



LIAKHOFF'S ISLAND.
(After a drawing by O. Nordquist.)

with difficulty." No one however now thinks with any apprehension of the two "holy capes," which in former times limited the voyages of the Russians and Fins living on the White Sea to the east and west, and this, I am quite convinced will some time be the case with this and all other holy capes in the Siberian Polar Sea.

The sea water in the sound was much mixed with river water and had a comparatively high temperature, even at a depth of

nine to eleven metres. The animal life at the sea bottom was poor in species but rich in individuals, consisting principally of *Idothea entomon*, of which Dr. Stuxberg counted 800 specimens from a single sweep of the dredge. There were obtained at the same time, besides a few specimens of *Idothea Sabinei*, sponges and bryozoa in great abundance, and small mussels, crustacea, vermes, &c. Various fishes were also caught, and some small algæ collected. The trawl-net besides brought up from the bottom some fragments of mammoth tusks, and a large number of pieces of wood, for the most part sticks or branches, which appear to have stood upright in the clay, to judge from the fact that one of their ends was often covered with living bryozoa. These sticks often caused great inconvenience to the dredgers, by tearing the net that was being dragged along the bottom.

On the night preceding the 31st August, as we steamed past Sviatoinos, a peculiar phenomenon was observed. The sky was clear in the zenith and in the east; in the west, on the other hand, there was a bluish-grey bank of cloud. The temperature of the water near the surface varied between $+1^{\circ}$ and $+1^{\circ}6$, that of the air on the vessel between $+1^{\circ}5$ and $+1^{\circ}8$. Although thus both the air and the water had a temperature somewhat above the freezing-point, ice was seen to form on the calm, mirror-bright surface of the sea. This ice consisted partly of needles, partly of a thin sheet. I have previously on several occasions observed in the Arctic seas a similar phenomenon, that is, the formation of ice when the temperature of the air was above the freezing-point. On this occasion, when the temperature of the uppermost stratum of water was also above the freezing-point, the formation of ice was clearly a sort of hoar-frost phenomenon, caused by radiation of heat, perhaps both upwards towards the atmosphere and downwards towards the bottom layer of water, cooled below the freezing-point.

The whole day we continued our voyage eastwards with glorious weather over a smooth ice-free sea, and in the same way on the 1st September, with a gentle southerly wind, the temperature of the air at noon in the shade being $+5^{\circ}6$. On the night before the 2nd September the wind became northerly and the temperature of

the air sank to -1° . Little land was seen, though we were still not very far from the coast. Near to it there was a broad ice-free, or nearly ice-free, channel, but farther out to sea ice commenced. The following night snow fell, so that the whole of the deck and the Bear Islands, which we reached on the 3rd September, were sprinkled with it.

Hitherto, during the whole time we sailed *along the coast*, we had scarcely met with any fields of drift-ice but such as were formed of rotten, even, thin, and scattered pieces of ice, in many places almost converted into ice-sludge, without an "ice-foot" and often dirty on the surface. No iceberg had been seen, nor any large glacier ice-blocks, such as on the coasts of Spitzbergen replace the Greenland icebergs. But east of Sviatoinos the ice began to increase in size and assume the same appearance as the ice north of Spitzbergen. It was here, besides, less dirty, and rested on a hard ice-foot projecting deep under water and treacherous for the navigator.

The ice of the Polar Sea may be divided into the following varieties :—

1. *Icebergs*. The true icebergs have a height above the surface of the water rising to 330 feet. They often ground in a depth of 660 to 1000 feet, and have thus sometimes a cross section of 1,330, perhaps 1,600 feet. Their area may amount to several square miles. Such enormous blocks of ice are projected into the North Polar Sea only from the glaciers of Greenland, and according to Payer's statement, from those of Franz-Josef Land also ; but not, as some authors (GEIKIE, BROWN, and others) appear to assume and have shown by incorrect ideal drawings, from glaciers which project into the sea and there terminate with a perpendicular evenly-cut border, but from very uneven glaciers which always enter the sea in the bottoms of deep fiords, and are split up into icebergs long before they reach it. It is desirable that those who write on the origin of icebergs, should take into consideration the fact that icebergs are only formed at places where a violent motion takes place in the mass of the ice, which again within a comparatively short time results in the excavation of the deep ice-fiord. The largest iceberg, which, so far as I know, has been *measured*

in that part of the Polar Sea which lies between Spitzbergen and Wrangel Land, is one which Barents saw at Cape Nassau on the 17th = 7th August, 1596. It was sixteen fathoms high, and had grounded in a depth of thirty-six fathoms. In the South Polar Sea icebergs occur in great numbers and of enormous size. If we may assume that they have an origin similar to those of Greenland, it is probable that round the South Pole there is an extensive continent indented by deep fiords.

2. *Glacier Ice-blocks.* These, which indeed have often been called icebergs, are distinguished from true icebergs not only by their size, but also by the way in which they are formed. They have seldom a cross section of more than 100 or 130 feet, and it is only exceptionally that they are more than thirty-three feet above the surface of the water. They originate from the "calving" of glaciers which project into the sea with a straight and evenly high precipitous border. Such glaciers occur in large numbers on the coasts of Spitzbergen, and they are there of the same height as similar evenly-cut glaciers on Greenland. Glacier ice-blocks occur abundantly on the coasts of Spitzbergen and North Novaya Zemlya, but appear to be wanting or exceedingly rare along the whole north coast of Asia, between Yugor Schar and Wrangel Land. East of this they again occur, but not in any great numbers. This appears to show that the Western Siberian Polar Sea is not surrounded by any glacial lands. The glacier ice is commonly of a blue colour. When melted it yields a pure water, free of salt. Sometimes however it gives traces of salt, which are derived from the spray which the storms have carried high up on the surface of the glacier.

3. Pieces of ice from the ice-foot formed along the sea beach or the banks of rivers. They rise sometimes fifteen or twenty feet above the surface of the water. They consist commonly of dirty ice, mixed with earth.

4. *River Ice*, level, comparatively small ice-fields, which, when they reach the sea, are already so rotten that they soon melt away and disappear.

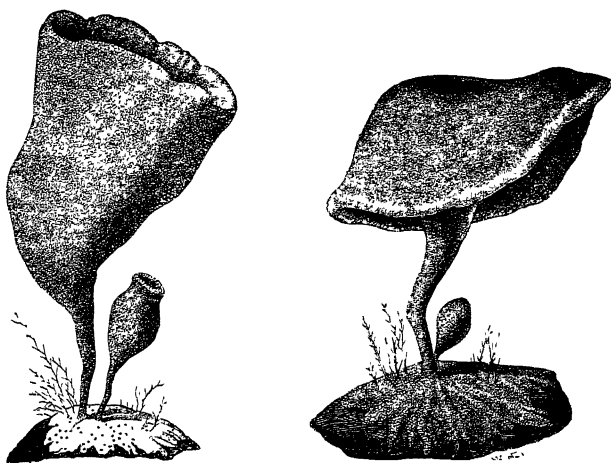
5. The walrus-hunters' *Bay Ice*; by which we understand level ice-fields formed in fiords and bays along the coast, and

which have there been exposed to a comparatively early summer heat. The bay ice therefore melts away completely during summer, and it is not commonly much pressed together. Nearly all the ice we met with in the course of our voyage belonged to this variety.

6. *Sea Ice*, or heavy ice, which often exhibits traces of having been much pressed together, but has not been exposed to any early summer heat. The walrus-hunters call it sea-ice, wishing, I imagine, to indicate thereby that it is formed in the sea farther up towards the north. That it has drifted down from the north is indeed correct, but that it has been formed far from land over a considerable depth in the open sea is perhaps uncertain, as the ice that is formed there cannot, we think, be very thick. It has rather perhaps drifted down from the neighbourhood of some yet unknown Polar continent. Of this ice are formed most of the ice-fields in the seas east of Greenland, north of Spitzbergen, between Spitzbergen and the north island of Novaya Zemlya, and north of Behring's Straits. In the northern seas it does not melt completely during the summer, and remains of sea-ice therefore often enter as component parts into the bay ice formed during the following winter. The latter then becomes rough and uneven, from remnants of old sea-ice being frozen into the newly formed ice. Sea ice is often pressed together so as to form great *torosses* or ice-casts, formed of pieces of ice which at first are angular and piled loose on each other, but gradually become rounded, and freeze together into enormous blocks of ice, which, together with the glacier ice-blocks, form the principal mass of the ground ice found on the coasts of the Polar lands. The water which is obtained by melting sea-ice is not completely free from salt, but the older it is the less salt does it contain.

East of the Bear Islands heavy sea-ice in pretty compact masses had drifted down towards the coast, but still left an open ice-free channel along the land. Here the higher animal world was exceedingly poor, which, as far as the avi-fauna was concerned, must be in some degree ascribed to the late season of the year. For Wrangel mentions a cliff at the Bear Islands which was

covered with numberless birds' nests. He saw, besides, on the largest of these islands, traces of the bear, wolf, fox, lemming, and reindeer (Wrangel's *Reise*, i. pp. 304 and 327). Now the surrounding sea was completely deserted. No Polar bear saluted us from the ice-floes, no walruses, and only very few seals were visible. During many watches not a single natatory bird was seen. Only the phalarope was still met with in large numbers, even pretty far out at sea. Perhaps it was then migrating from the north. The lower animal world was more abundant.



BEAKER SPONGES.

From the sea off the mouth of the Kolyma.

From the surface of the sea the drag-net brought up various small surface crustacea, inconsiderable in themselves, but important as food for larger animals ; and from the sea-bottom were obtained a large number of the same animal forms as from the sound at Sviatoinos, and in addition some beautiful asterids and a multitude of very large beaker sponges.

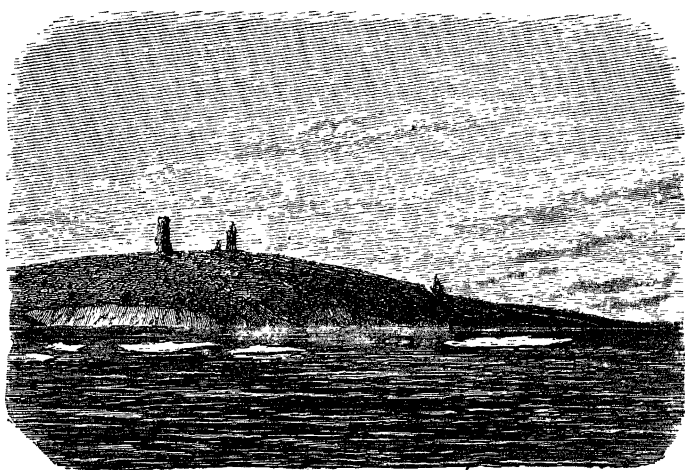
On the 3rd September, after we had sailed past the Bear Islands, the course was shaped right for Cape Shelagskoi. This

course, as will be seen by a glance at the map, carried us far from the coast, and thus out of the channel next the land, in which we had hitherto sailed. The ice was heavy and close, although at first so distributed that it was navigable. But with a north wind, which began to blow on the night before the 1st September, the temperature fell below the freezing-point, and the water between the pieces of drift-ice was covered with a very thick crust of ice, and the drift-ice came closer and closer together. It thus became impossible to continue the course which we had taken. We therefore turned towards the land, and at 6 o'clock p.m., after various bends in the ice and a few collisions with the pieces of ice that barred our way, again reached the ice-free channel, five to seven miles broad, next the land. While we lay a little way in among the drift-ice fields we could see no sign of open water, but it appeared as if the compact ice extended all the way to land, a circumstance which shows how careful the navigator ought to be in expressing an opinion as to the nature of the pack beyond the immediate neighbourhood of the vessel. The temperature of the air, which in the ice-field had sunk to $-3^{\circ}\text{C}.$, now rose at once to $+4^{\circ}\cdot 1$, while that of the water rose from $-1^{\circ}\cdot 2$ to $+3^{\circ}\cdot 5$, and its salinity fell from 2·4 to 1·3 per cent. All showed that we had now come into the current of the Kolyma, which from causes which have been already stated, runs from the mouth of the river along the land in an easterly direction.

The Bear Islands lying off the mouth of the Kolyma are, for the most part, formed of a plutonic rock, whose upper part has weathered away, leaving gigantic isolated pillars. Four such pillars have given to the easternmost of the islands the name Lighthouse Island (*Fyprelarön*). Similar ruin-like formations are found not only on Cape Baranov, which lies right opposite, but also at a great number of other places in that portion of the north coast of Siberia which lies farther to the east. Generally these cliff-ruins are collected together over considerable areas in groups or regular rows. They have thus, when seen from the sea, so bewildering a resemblance to the ruins of a gigantic city which had once been surrounded by strong walls and been full of temples and splendid buildings, that one is almost tempted to see

in them memorials of the exploits of a Tamerlane or a Chingis Khan up here in the high north.

The north side of the hill-tops was powdered with new-fallen snow, but the rest of the land was clear of snow. The distance between the south point of Liakhoff's Island and the Bear Islands is 360 nautical miles. This distance we had traversed in three days, having thus made 120 miles in the twenty-four hours, or five miles per hour. If we consider the time lost in



LIGHTHOUSE ISLAND
(After a drawing by O Nordquist)

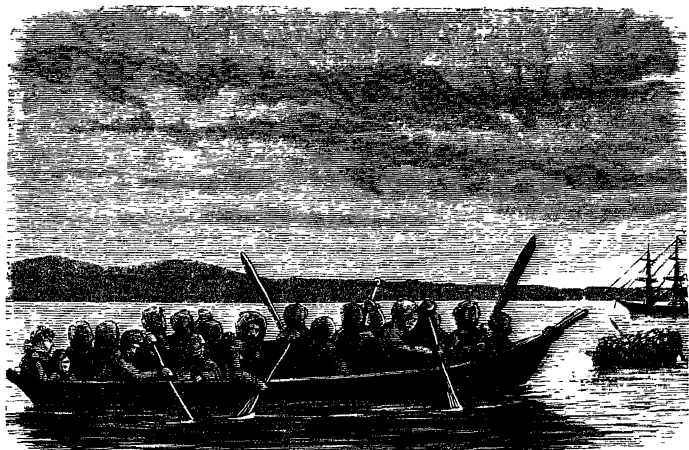
dredging, sounding, and determining the temperature and salinity of the water, and the caution which the navigator must observe during a voyage in quite unknown waters, this speed shows that during this part of our voyage we were hindered by ice only to a slight extent. Cape Baranov was passed on the night before the 5th September, the mouth of Chaun Bay on the night before the 6th September, and Cape Shelagskoi was reached on the 6th at 4 o'clock p.m. The distance in a right line between this headland

and the Bear Islands is 180 nautical miles. In consequence of the many *détours* in the ice, we had required $2\frac{1}{2}$ days to traverse this distance, which corresponds to seventy-two miles per day, or three miles per hour, a speed which in a voyage in unknown, and for the most part ice-bestrewed waters, must yet be considered very satisfactory. But after this, our progress began to be much slower. At midnight the sun was already 12° to 13° below the horizon, and the nights were now so dark that at that time of day we were compelled to lie still anchored to some large ground-ice. A further loss of time was caused by the dense fog which often prevailed by day, and which in the unknown shallow water next the land compelled Captain Palander to advance with extreme caution. The navigation along the north coast of Asia began to get somewhat monotonous. Even the most zealous Polar traveller may tire at last of mere ice, shallow water and fog; and mere fog, shallow water and ice.

Now, however, a pleasant change began, by our coming at last in contact with natives. In the whole stretch from Yugor Schar to Cape Shelagskoi, we had seen neither men nor human habitations, if I except the old uninhabited hut between Cape Chelyuskin and Khatanga. But on the 6th September, when we were a little way off Cape Shelagskoi, two boats were sighted. Every man, with the exception of the cook, who could be induced by no catastrophe to leave his pots and pans, and who circumnavigated Asia and Europe perhaps without having been once on land, rushed on deck. The boats were of skin, built in the same way as the "umiaks" or women's boats of the Eskimo. They were fully laden with laughing and chattering natives, men, women, and children, who indicated by cries and gesticulations that they wished to come on board. The engine was stopped, the boats lay to, and a large number of skin-clad, bare-headed beings climbed up over the gunwale in a way that clearly indicated that they had seen vessels before. A lively talk began, but we soon became aware that the crews of the boats and the vessel knew no language in common. It was an unfortunate circumstance, but signs were employed as far as possible. This did not prevent the chatter from going on, and great gladness soon came to prevail, especially

when some presents began to be distributed, mainly consisting of tobacco and Dutch clay pipes. It was remarkable that none of them could speak a single word of Russian, while a boy could count tolerably well up to ten in English, which shows that the natives here come into closer contact with American whalers than with Russian traders. They acknowledged the name *chukchi* or *chauchu*.

Many of them were tall, well-grown men. They were clothed



CHUKCHI BOATS.

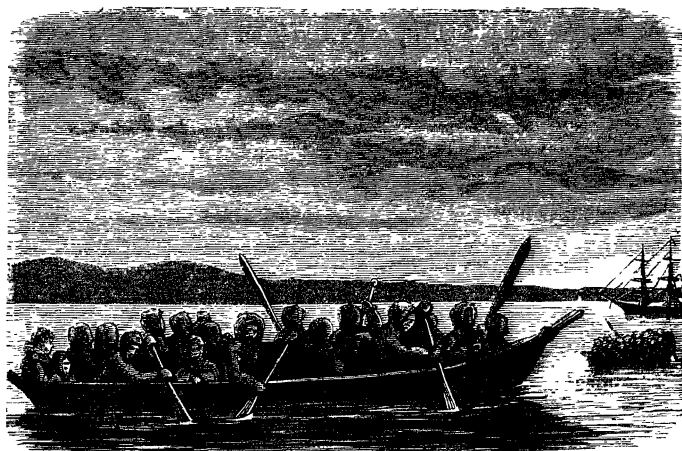
in close-fitting skin trousers and "pesks" of reindeer skin. The head was bare, the hair always clipped short, with the exception of a small fringe in front, where the hair had a length of $1\frac{1}{2}$ inch, and was combed down over the brow. Some had a cap of the sort used by the Russians at Khabarova, stuck into the belt behind, but they appeared to consider the weather still too warm for the use of this head-covering. The hair of most of them was bluish-black and exceedingly thick. The women were tattooed with black or bluish-black lines on the brow and nose, a number

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of similar lines on the chin, and finally some embellishments on the cheeks. The type of face did not strike one as so unpleasant as that of the Samoyeds or Eskimo. Some of the young girls were even not absolutely ugly. In comparison with the Samoyeds they were even rather cleanly, and had a beautiful, almost reddish-white complexion. Two of the men were quite fair. Probably they were descendants of Russians, who for some reason or other, as prisoners of war or fugitives, had come to live among the Chukches and had been nationalised by them.

In a little we continued our voyage, after the Chukches had returned to their boats, evidently well pleased with the gifts they had received and the leaf tobacco I had dealt out in bundles,—along with the clay pipes, of which every one got as many as he could carry between his fingers,—with the finery and old clothes which my comrades and the crew strewed around them with generous hand. For we were all convinced that after some days we should come to waters where winter clothes would be altogether unnecessary, where our want of any article could easily be supplied at the nearest port, and where the means of exchange would not consist of goods, but of stamped pieces of metal and slips of paper.

On the 7th September we steamed the whole day along the coast in pretty open ice. At night we lay to at a floe. The hempen tangles and the trawl-net were put out and yielded a very rich harvest. But in the morning we found ourselves again so surrounded by ice and fog, that, after several unsuccessful attempts to make an immediate advance, we were compelled to lie to at a large piece of drift-ice near the shore. When the fog had lightened so much that the vessel could be seen from the land, we were again visited by a large number of natives, whom as before we entertained as best we could. They invited us by evident signs to land and visit their tents. As it was in any case impossible immediately to continue our voyage, I accepted the invitation, ordered a boat to be put out, and landed along with most of my comrades.

The beach here is formed of a low bank of sand which runs between the sea and a small shallow lagoon or fresh-water lake, whose surface is nearly on a level with that of the sea. Farther

into the interior the land rises gradually to bare hills, clear of snow or only covered with a thin coating of powdered snow from the fall of the last few days. Lagoon formations, with either fresh or salt water, of the same kind as those which we saw



A CHUKCHI IN SEAL-GUT GREAT COAT.
(After a photograph by L. Palander.)

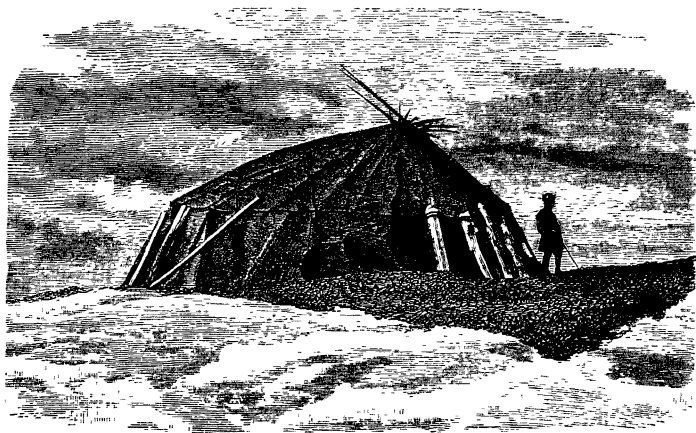
here for the first time, are distinctive of the north-eastern coast of Siberia. It is these formations which gave rise to the statement that on the north coast of Siberia it is difficult to settle the boundaries between sea and land. In winter this may be difficult enough, for the low bank which separates the lagoon

from the sea is not easily distinguished when it has become covered with snow, and it may therefore readily happen in winter journeys along the coast that one is far into the land while he still believes himself to be out on the sea-ice. But when the snow has melted, the boundary is sharp enough, and the sea by no means shallow for such a distance as old accounts would indicate. A continual action of the ice on the mud also goes on here during the whole summer. Quite close to the beach accordingly the depth of water is about seven feet, and three-fifths of a mile farther out thirty-three to thirty-six feet. Off the high rocky promontories the water is commonly navigable even for vessels of considerable draught close to the foot of the cliffs.

The villages of the Chukches commonly stand on the bank of sand which separates the lagoon from the sea. The dwellings consist of roomy skin tents, which incloses a sleeping chamber of the form of a parallelopiped surrounded by warm well-prepared reindeer skins, and lighted and warmed by one or more train-oil lamps. It is here that the family sleep during summer, and here most of them live day and night during winter. In summer, less frequently in winter, a fire is lighted besides in the outer tent with wood, for which purpose a hole is opened in the top of the raised tent-roof. But to be compelled to use wood for heating the inner tent the Chukches consider the extremity of scarcity of fuel.

We were received everywhere in a very friendly way, and were offered whatever the house afforded. At the time the supply of food was abundant. In one tent reindeer beef was being boiled in a large cast-iron pot. At another two recently shot or slaughtered reindeer were being cut in pieces. At a third an old woman was employed in taking out of the paunch of the reindeer the green spinage-like contents and cramming them into a sealskin bag, evidently to be preserved for green food during winter. The hand was used in this case as a scoop, and the naked arms were coloured high up with the certainly unappetising spinage, which however, according to the statements of Danish colonists in Greenland, has no unpleasant taste. Other skin sacks filled with train-oil stood in rows along the walls of the tent.

The Chukches offered train oil for sale, and appeared to be surprised that we would not purchase any. In all the tents were found seals cut in pieces, a proof that the catch of seals had recently been abundant. At one tent lay two fresh walrus heads with large beautiful tusks. I tried without success to purchase these heads, but next day the tusks were offered to us. The Chukches appear to have a prejudice against disposing of the heads of slain animals. According to older travellers they even pay the walrus-head a sort of worship.



CHUKCHI TENT

(After a Photograph by L. Palander.)

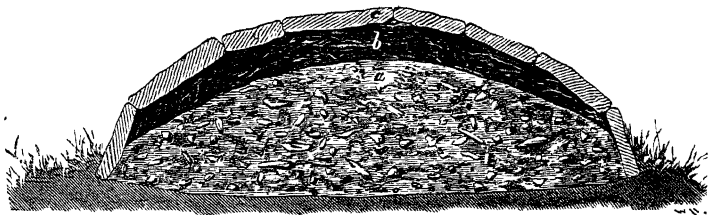
Children were met with in great numbers, healthy and thriving. In the inner tent the older children were nearly naked, and I saw them go out from it without shoes or other covering and run between the tents on the hoarfrost-covered ground. The younger were carried on the shoulders both of men and women, and were then so wrapped up that they resembled balls of skin. The children were treated with marked friendliness, and the older ones were never heard to utter an angry word. I purchased

here a large number of household articles and dresses, which I shall describe further on.

On the morning of the 9th September we endeavoured to steam on, but were soon compelled by the dense fog to lie to again at some ground-ice, which, when the fog lightened, was found to have stranded quite close to land. The depth here was thirty-six feet. At this place we lay till the morning of the 10th. The beach was formed of a sandbank,¹ which immediately above high-water mark was covered with a close grassy turf, a proof that the climate here, notwithstanding the neighbourhood of the pole of cold, is much more favourable to the development of vegetation than even the most favoured parts of the west coast of Spitzbergen. Farther inland was seen a very high, but snow-free, range of hills, and far beyond them some high snow-covered mountain summits. No glaciers were found here, though I consider it probable that small ones may be found in the valleys between the high fells in the interior. Nor were any erratic blocks found either in the interior of the coast country or along the strand bank. Thus it is probable that no such ice-covered land as Greenland for the present bounds the Siberian Polar Sea towards the north. At two places at the level of the sea in the neighbourhood of our anchorage the solid rock was bare. There it formed perpendicular shore cliffs, nine to twelve metres high, consisting of magnesian slate, limestone more or less mixed with quartz, and silicious slate. The strata were nearly perpendicular, ran from north to south, and did not contain any fossils. From a geological point of view therefore these rocks were of little interest. But they were abundantly covered with lichens, and yielded to Dr. Almquist important contributions to a knowledge of the previously quite unknown lichen flora of this region.

¹ Of course the earth here at an inconsiderable depth under the surface is constantly frozen, but I have nowhere seen such alternating layers of earth and ice, crossed by veins of ice, as Hedenstrom in his oft-quoted work (*Otryvki o Sibiri*, p. 119) says he found at the sea-coast. Probably such a peculiar formation arises only at places where the spring floods bring down thick layers of mud, which cover the beds of ice formed during the winter and protect them for thousands of years from melting. I shall have an opportunity of returning to the interesting questions relating to this point.

The harvest of the higher land plants on the other hand was, in consequence of the far advanced season of the year, inconsiderable, if also of great scientific interest as coming from a region never before visited by any botanist. In the sea Dr. Kjellman dredged without success for algæ. Of the higher animals we saw only a walrus and some few seals, but no land mammalia. Lemmings must however occasionally occur in incredible numbers, to judge by the holes and passages excavated by these animals, by which the ground is crossed in all directions. Of birds the phalarope was still the most common species, especially at sea, where in flocks of six or seven it swam incessantly backwards and forwards between the pieces of ice.

SECTION OF A CHUKCHI GRAVE.¹

(After a drawing by A. Stuxberg.)

a Layer of burned bones, much weathered. b Layer of turf and twigs. c Stones

No tents were met with in the neighbourhood of the vessel's anchorage, but at many places along the beach there were seen marks of old encampments, sooty rolled stones which had been used in the erection of the tents, broken household articles, and above all remains of the bones of the seal, reindeer, and walrus. At one place, a large number of walrus skulls lay in a ring, possibly remains from an entertainment following a large catch.

¹ Since we discovered the Chukches also bury their dead by laying them out on the *tundra*, we have begun to entertain doubts whether the collection of bones delineated here was actually a grave. Possibly these mounds were only the remains of fireplaces, where the Chukches had used as fuel train-drenched bones, and which they had afterwards for some reason or other endeavoured to protect from the action of the atmosphere.

Near the place where the tents had stood, at the mouth of a small stream not yet dried up or frozen, Dr. Stuxberg discovered some small mounds containing burnt bones. The cremation had been so complete that only one of the pieces of bone that were found could be determined by Dr. Almquist. It was a human tooth. After cremation the remains of the bones and the ash had been collected in an excavation, and covered first with turf and then with small flat stones. The encampment struck me as having been abandoned only a few years ago, and even the collections of bones did not appear to me to be old. But we ought to be very cautious when we endeavour in the Arctic regions to estimate the age of an old encampment, because in judging of the changes which the surface of the earth undergoes with time we are apt to be guided by our experience from more southerly regions. To how limited an extent this experience may be utilised in the high north is shown by RINK's assertion that on Greenland at some of the huts of the Norwegian colonists, which have been deserted for centuries, footpaths can still be distinguished,¹ an observation to which I would scarcely give credence, until I had myself seen something similar at the site of a house in the bottom of Jacobshaven ice-fiord in north-western Greenland, which had been abandoned for one or two centuries. Here footpaths as sharply defined as if they had been trampled yesterday ran from the ruin in different directions. It may therefore very readily happen that the encampments in the neighbourhood of our present anchorage were older than we would be inclined at first sight to suppose. No refuse heaps of any importance were seen here.

This was the first time that any vessel had lain to on this coast. Our arrival was therefore evidently considered by the natives a very remarkable occurrence, and the report of it appears to have spread very rapidly. For though there were no tents in the neighbourhood, we had many visitors. I still availed myself of the opportunity of procuring by barter a large number of articles distinctive of the Chukches' mode of life. Eight

¹ H. Rink, *Grönland geographiske og statistiske beskrevet*, Bd. 2, Copenhagen, 1857, p. 344.

years before I had collected and purchased a large number of ethnographical articles, and I was now surprised at the close correspondence there was between the household articles purchased from the Chukches, and those found in Greenland in old Eskimo graves.

My traffic with the natives was on this occasion attended with great difficulty, for I suffered from a sensible want of the first condition for the successful prosecution of a commercial undertaking, goods in demand. Because, during the expeditions of 1875 and 1876, I found myself unable to make use of the small wares I carried with me for barter with the natives, and found that Russian paper-money was readily taken, I had, at the departure of the *Vega* from Sweden, taken with me only money, not wares intended for barter. But money was of little use here. A twenty-five rouble note was less valued by the Chukches than a showy soap-box, and a gold or silver coin less than tin or brass buttons. I could, indeed, get rid of a few fifty-öre pieces, but only after I had first adapted them by boring to take the place of earrings.

The only proper wares for barter I now had were tobacco and Dutch clay pipes. Of tobacco I had only some dozen bundles, taken from a parcel which Mr. Sibiriakoff intended to import into Siberia by the Yenisei. Certain as I was of reaching the Pacific this autumn, I scattered my stock of tobacco around me with so liberal a hand that it was soon exhausted, and my Chukchi friends' wants satisfied for several weeks. I therefore, as far as this currency was concerned, when the *Vega* was beset, suffered the prodigal's fate of being soon left with an empty purse. Dutch clay pipes, again, I had in great abundance, from the accident that two boxes of these pipes, which were to have been imported into Siberia with the expedition of 1876, did not reach Trondhjem until the *Ymer* had sailed from that town. They were instead taken on the *Vega*, and now, though quite too fragile for the hard fingers of Chukches, answered well for smaller bargains, as gifts of welcome to a large number of natives collected at the vessel, and as gifts to children in order to gain the favour of their parents. I besides distributed a large

quantity of silver coin with King Oscar's effigy, in order, if any misfortune overtook us, to afford a means of ascertaining the places we had visited.

For the benefit of future travellers I may state that the wares most in demand are large sewing and darning needles, pots, knives (preferably large), axes, saws, boring tools and other iron tools, linen and woollen shirts (preferably of bright colours, but also white), neckerchiefs, tobacco and sugar. To these may be added the spirits which are in so great request among all savages; a currency of which, indeed, there was great abundance on the *Vega*, but which I considered myself prevented from making use of. In exchange for this it is possible to obtain, in short, anything whatever from many of the natives, but by no means from all, for even here there are men who will not taste spirits, but with a gesture of disdain refuse the glass that is offered them. The Chukches are otherwise shrewd and calculating men of business, accustomed to study their own advantage. They have been brought up to this from childhood through the barter which they carry on between America and Siberia. Many a beaver-skin that comes to the market at Irbit belongs to an animal that has been caught in America, whose skin has passed from hand to hand among the wild men of America and Siberia, until it finally reaches the Russian merchant. For this barter a sort of market is held on an island in Behring's Straits. At the most remote markets in Arctic America, a beaver-skin is said some years ago to have been occasionally exchanged for a leaf of tobacco.¹ An exceedingly beautiful black fox-skin was offered to me by a Chukchi for a pot. Unfortunately I had none that I could dispense with. Here, too, prices had risen. When the Russians first came to Kamchatka, they got eight sable-skins for a knife, and eighteen for an axe, and yet the Kamchadales laughed at the credulous foreigners who were so easily deceived. At Yakutsk, when the Russians first settled there, a pot was even sold for as many sable-skins as it could hold.²

¹ C. von Dittmar, *Bulletin hist.-philolog. de l'Acad. de St. Pétersbourg*, XIII. 1856, p. 130.

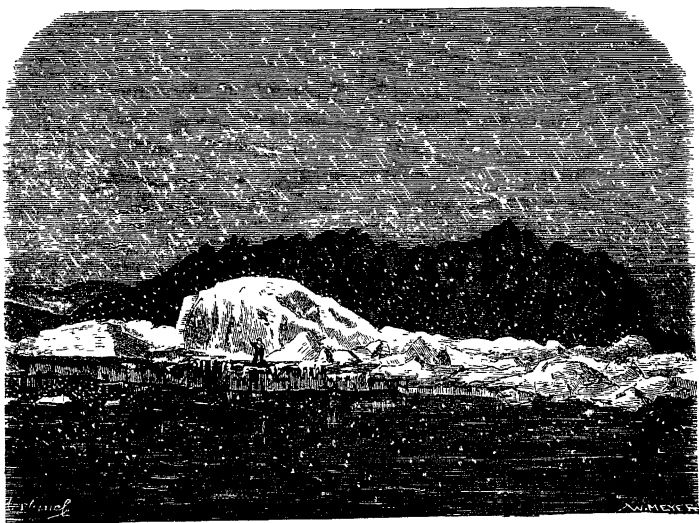
² Krascheninnikov, *Histoire et Description du Kamtschatka*, Amsterdam, 1770, II. p. 95. A. Erman, *Reise um die Erde*, D. 1, B. 2, p. 255.

During the night before the 10th September, the surface of the sea was covered with a very thick sheet of newly-frozen ice which was broken up again in the neighbourhood of the vessel by blocks of old ice drifting about. The pack itself appeared to have scattered a little. We therefore weighed anchor to continue our voyage. At first a *détour* towards the west was necessary to get round a field of drift-ice. Here too, however, our way was barred by a belt of old ice, which was bound together so firmly by the ice that had been formed in the course of the night, that a couple of hours' work with axes and ice-hatchets was required to open a channel through it. On the other side of this belt of ice we came again into pretty open water, but the fog, instead, became so dense that we had again to lie to at a ground-ice, lying farther out to the sea but more to the west than our former resting-place. On the night before the 11th there was a violent motion among the ice. Fortunately the air cleared in the morning, so that we could hold on our course among pretty open ice, until on the approach of night we were obliged as usual to lie-to at a ground-ice.

The following day, the 12th September, when we had passed Irkaipi, or Cape North, a good way, we fell in with so close ice that there was no possibility of penetrating farther. We were therefore compelled to return, and were able to make our way with great difficulty among the closely packed masses of drift ice. Here the vessel was anchored in the lee of some ground-ice, which had stranded near the northernmost spur of Irkaipi, until a strong tidal current began to carry large pieces of drift-ice past the vessel's anchorage. She was now removed and anchored anew in a little bay open to the north, which was formed by two rocky points jutting out from the mainland. Unfortunately we were detained here, waiting for a better state of the ice, until the 18th September. It was this involuntary delay which must be considered the main cause of our wintering.

Irkaipi is the northernmost promontory in that part of Asia, which was seen by Cook in 1778. It was, therefore, called by him Cape North, a name which has since been adopted in most maps, although it is apt to lead to confusion from capes similarly

named being found in most countries. It is also incorrect, because the cape does not form the northernmost promontory either of the whole of Siberia, or of any considerable portion of it. For the northernmost point of the mainland of Siberia is Cape Chelyuskin, the northernmost in the land east of the Lena Sviatoinos, the northernmost in the stretch of coast east of Chaun Bay, Cape Shelagskoi, and so on. Cape North ought, therefore,



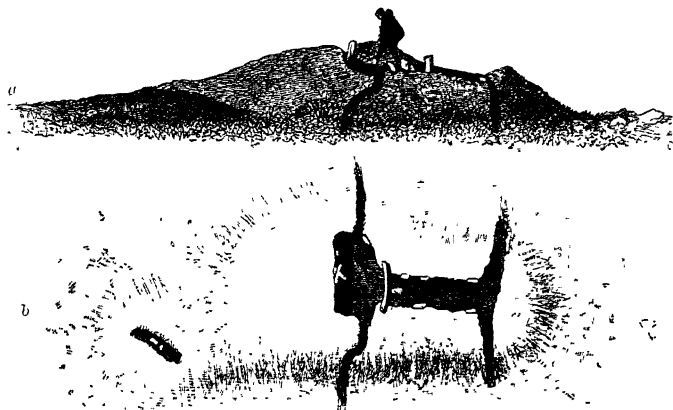
IRKAÏPI.

(After a drawing by O. Nordquist.)

to be replaced by the original name Irkaipi, which is well known to all the natives between Chaun Bay and Behring's Straits.

On the neck of land which connects Irkaipi with the mainland, there was at the time of our visit a village consisting of sixteen tents. We saw here also ruins, viz. the remains of a large number of old house-sites, which belonged to a race called

Onkilon,¹ who formerly inhabited these regions, and some centuries ago were driven by the Chukches, according to tradition, to some remote islands in the Polar Sea. At these old house-sites Dr. Almquist and Lieutenant Nordquist set on foot excavations in order to collect contributions to the ethnography of this traditional race. The houses appear to have been built, at least partly, of the bones of the whale, and half sunk in the earth. The refuse heaps in the neighbourhood contained bones of



REMAINS OF AN ONKILON HOUSE.

a Seen from the side.

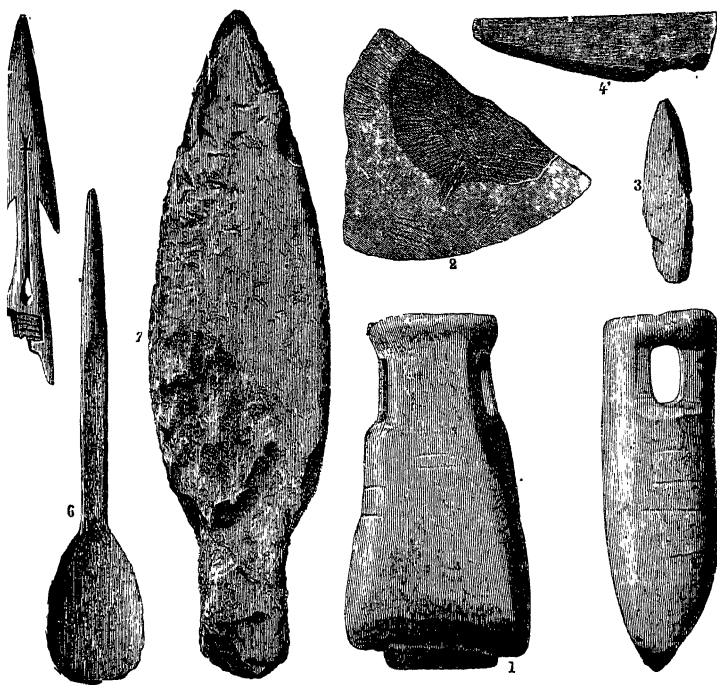
b. From above.

(After a drawing by O. Nordquist.)

several species of the whale, among them the white whale, and of the seal, walrus, reindeer, bear, dog, fox, and various kinds of birds. Besides these remains of the produce of the chase, there were found implements of stone and bone, among which were stone axes, which, after lying 250 years in the earth, were still fixed to their handles of wood or bone. Even the thongs with which

¹ *Ankali* signifies in Chukchi dwellers on the coast, and is now used to denote the Chukches living on the coast. A similar word, *Onkilon*, was formerly used as the name of the Eskimo tribe that lived on the coast of the Polar Sea when the Chukchi migration reached that point.

the axe had been bound fast to, or *wedged into*, the handle, were still remaining. The tusks of the walrus¹ had to the former inhabitants of the place, as to the Chukches of the present, yielded a material which in many cases may be used with greater



IMPLEMENTS FOUND IN THE RUINS OF AN ONKILON HOUSE.

1. Stone chisel with bone handle, one-half the natural size. 2, 4. Knives of slate, one-third.
3, 7. Spear-heads of slate, one-third. 5. Spear-head of bone, one-third.
6. Bone spoon, one-third.

advantage than flint for spear-heads, bird-arrows, fish-hooks, ice-axes, &c. Walrus tusks, more or less worked, accordingly were found in the excavations in great abundance. The bones

¹ The walrus now appears to be very rare in the sea north of Behring's Straits, but formerly it must have been found there in large numbers, and

of the whale had also been employed on a great scale, but we did not find any large pieces of mammoth tusks, an indication that the race was not in any intimate contact with the inhabitants of the regions to the westward, so rich in the remains of the mammoth.¹ At many places the old Onkilon houses were used by the Chukches as stores for blubber; and at others, excavations had been made in the refuse heaps in search of walrus tusks. Our researches were regarded by the Chukches with mistrust. An old man who came, as it were by chance, from the interior of the country past the place where we worked, remained there a while, regarding our labours with apparent indifference, until he convinced himself that from simplicity, or some other reason unintelligible to him, we avoided touching the blubber-stores, but instead rooted up in search of old fragments of bone or stone-flakes.

Remains of old dwellings were found even at the highest points among the stone mounds of Irkaipi, and here perhaps was the last asylum of the Onkilon race. At many places on the mountain slopes were seen large collections of bones, consisting partly of a large number (at one place up to fifty) of bears' skulls overgrown with lichens, laid in circles, with the nose inwards, partly of the skulls of the reindeer, Polar bear,² and walrus, mixed together in a less regular circle, in the midst of which reindeer horns were found set up. Along with the reindeer horns there was found the coronal bone of an elk with

made that region a veritable paradise for every hunting tribe. While we during our long stay there saw only a few walruses, Cook, in 1778, saw an enormous number, and an interesting drawing of walruses is to be found in the account of his third voyage. *A Voyage to the Pacific Ocean, etc.*, Vol. III. (by James King), London, 1784, p. 259, pl. 52.

¹ The greatest number of mammoth tusks is obtained from the stretches of land and the islands between the Chantanga and Chaun Bay. Here the walrus is wanting. The inhabitants of North Siberia therefore praise the wisdom of the Creator, who lets the walrus live in the regions where the mammoth is wanting, and has scattered mammoth ivory in the earthy layers of the coasts where the walrus does not occur (A. Erman, *Reise um die Erde*, Berlin, 1833—48, D. 1, B. 2, p. 264).

² Among the bears' skulls brought home from this place Lieut. Nordquist found after his return home the skull of a sea-lion (*Otaria Stelleri*). It is, however, uncertain whether the animal was captured in the region, or whether the cranium was brought hither from Kamchatka.

portions of the horns still attached. Beside the other bones lay innumerable temple-bones of the seal, for the most part fresh and not lichen-covered. Other seal bones were almost completely absent, which shows that temple-bones were not remains of weathered seal skulls, but had been gathered to the place for one reason or another in recent times. No portions of human skeletons were found in the neighbourhood. These places are sacrificial places, which the one race has inherited from the other.

Between us and the inhabitants of the present Chukchi village at Irkaipi there soon arose very friendly relations. A somewhat stout, well-grown, tall and handsome man named Shepurin, we took at first to be chief. He was therefore repeatedly entertained in the gunroom, on which occasions small gifts were given him to secure his friendship. Shepurin had clearly a weakness for gentility and grandeur, and could now, by means of the barter he carried on with us and the presents he received, gratify his love of show to a degree of which he probably had never before dreamed. When during the last days of our stay he paid a visit to the *Vega* he was clad in a red woollen shirt drawn over his "pesk," and from either ear hung a gilt watch chain, to the lower end of which a perforated ten-öre piece was fastened. Already on our arrival he was better clothed than the others, his tent was larger and provided with two sleeping apartments, one for each of his wives. But notwithstanding all this we soon found that we had made a mistake, when, thinking that a society could not exist without government, we assigned to him so exalted a position. Here, as in all Chukchi villages which we afterwards visited, absolute "anarchy" prevailed.

At the same time the greatest unanimity reigned in the little headless community. Children, healthy and thriving, tenderly cared for by the inhabitants, were found in large numbers. A good word to them was sufficient to pave the way for a friendly reception in the tent. The women were treated as the equals of the men, and the wife was always consulted by the husband when a more important bargain than usual was to be made; many times it was carried through only after the giver of advice had

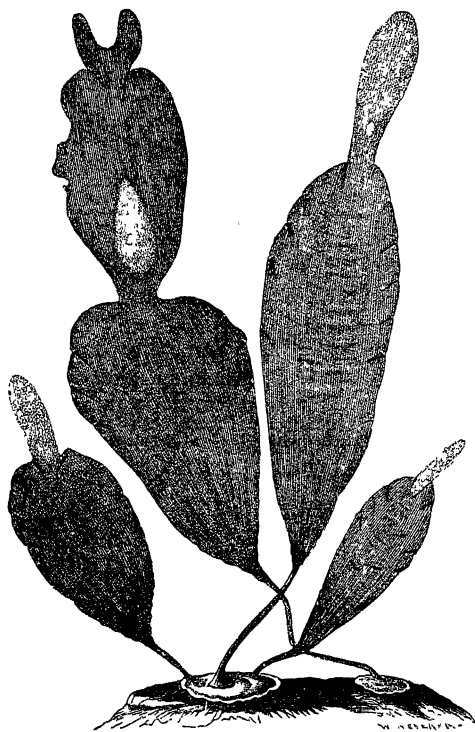
been bribed with a neckerchief or a variegated handkerchief. The articles which the man purchased were immediately committed to the wife's keeping. One of the children had round his neck a band of pearls with a Chinese coin having a square hole in the middle, suspended from it; another bore a perforated American cent piece. None knew a word of Russian, but here too a youngster could count ten in English. They also knew the word "ship." In all the tents, reindeer stomachs were seen with their contents, or sacks stuffed full of other green herbs. Several times we were offered in return for the bits of sugar and pieces of tobacco which we distributed, wrinkled root-bulbs somewhat larger than a hazel nut, which had an exceedingly pleasant taste, resembling that of fresh nuts. A seal caught in a net among the ice during our visit was cut up in the tent by the women. On this occasion they were surrounded by a large number of children, who were now and then treated to bloody strips of flesh. The youngsters carried on the work of cutting up *con amore*, coquetting a little with their bloody arms and faces.

The rock which prevails in this region consists mainly of gabbro, which in the interior forms several isolated, black, plateau-formed hills, 330 to 500 feet high, between which an even, grassy, but treeless plain extends. It probably rests on sedimentary strata. For on the western side of Irkaipi the plutonic rock is seen to rest on a black slate with traces of fossils, for the most part obscure vegetable impressions; probably belonging to the Permian Carboniferous formation.

Uneasy at the protracted delay here I made an excursion to a hill in the neighbourhood of our anchorage, which according to a barometrical measurement was 428 feet high, in order, from a considerable height, to get a better view of the ice than was possible by a boat reconnaissance. The hill was called by the Chukches Hammong-Ommang. From it we had an extensive view of the sea. It was everywhere covered with closely packed drift-ice. Only next the land was seen an open channel, which, however, was interrupted in an ominous way by belts of ice.

The plutonic rock, of which the hill was formed, was almost everywhere broken up by the action of the frost into angular

blocks of stone, so that its surface was converted into an enormous stone mound. The stones were on the wind side covered with a translucent glassy ice-crust, which readily fell away, and added considerably to the difficulty of the ascent. I



ALGA FROM IRKAIP.
Laminaria solidungula (J. G. Ag.).

had previously observed the formation of such an ice-crust on the northernmost mountain summits of Spitzbergen.¹ It arises

¹ Cf. *Redogörelse för den svenska polarexpeditionen år 1872-73* (Bihang till Vet. Ak. handl. Bd. 2, No. 18, p. 91).

undoubtedly from the fall of super-cooled mist, that is to say of mist whose vesicles have been cooled considerably below the freezing-point without being changed to ice, which first takes place when, after falling, they come in contact with ice or snow, or some angular hard object. It is such a mist that causes the icing down of the rigging of vessels, a very unpleasant phenomenon for the navigator, which we experienced during the following



CORMORANT FROM IRKAIPI.
Graculus bicristatus (Pallas).

days, when the tackling of the *Vega* was covered with pieces of ice so large, and layers so thick, that accidents might have happened by the falling of the ice on the deck.

The dredgings here yielded to Dr. Kjellman some algæ, and to Dr. Stuxberg masses of a species of cumacea, *Diastylis Rathkei* Kr., of *Acanthostephia Malmgreni* Goës, and *Liparis gelatinosus* Pallas, but little else. On the steep slopes of the north side of

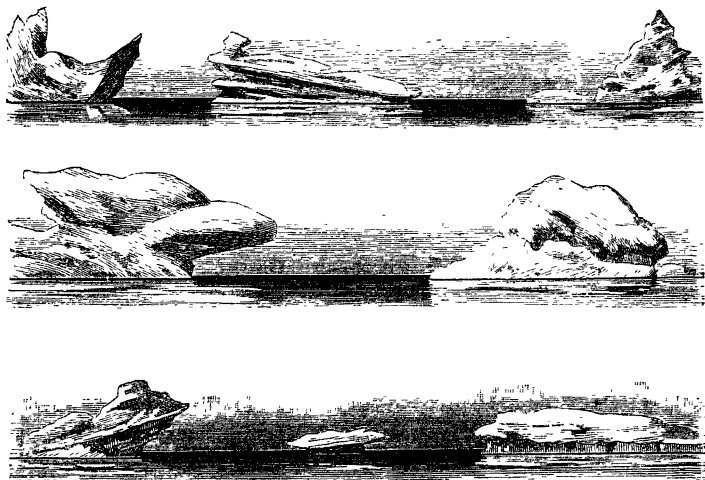
Irkaipi a species of comorant had settled in so large numbers that the cliff there might be called a true fowl-fell. A large number of seals were visible among the ice, and along with the comorant a few other birds, principally phalaropes. Fish were now seen only in exceedingly small numbers. Even in the summer, fishing here does not appear to be specially abundant, to judge from the fact that the Chukches had not collected any stock for the winter. We were offered, however, a salmon or two of small size.

On the 18th September¹ the state of the ice was quite unchanged. If a wintering was to be avoided, it was, however, not advisable to remain longer here. It had besides appeared from the hill-top which I visited the day before that an open water channel, only interrupted at two places by ice, was still to be found along the coast. The anchor was accordingly weighed, and the *Vega* steamed on, but in a depth of only twenty to twenty-six feet. As the *Vega's* draught is from 15·7 to 16·4 feet, we had only a little water under the keel, and that among ice in quite unknown waters. About twelve miles from the anchorage we met with a belt of ice through which we could make our way though only with great difficulty, thanks to the *Vega's* strong bow enabling her to withstand the violent concussions. Our voyage was then continued, often in yet shallower water than before, until the vessel, at 8 o'clock in the morning, struck on ground-ice foot. The tide was falling, and on that account it was not until next morning that we could get off, after a considerable portion of the ground-ice, on whose foot the *Vega* had run up, had been hewn away with axes and ice-hatchets. Some attempts were made to

¹ Irkaipi lies in 180° long. from Greenwich. To bring our day-reckoning into agreement with that of the New World, we ought thus to have here lessened our date by one day, and have written the 17th for the 18th September. But as, with the exception of the short excursion to Port Clarence and St. Edward Island, we always followed the coasts of the Old World, and during our stay in the new hemisphere did not visit any place inhabited by Europeans, we retained during the whole of our voyage our European day-reckoning unaltered. If we had met with an American whaler, we would have been before him one day, our 27th September would thus have corresponded to his 26th. The same would have been the case on our coming to an American port.

blast the ice with gunpowder, but they were unsuccessful. For this purpose dynamite is much more efficacious, and this explosive ought therefore always to form part of the equipment in voyages in which belts of ice have to be broken through.

On the 19th we continued our voyage in the same way as before, in still and for the most part shallow water near the coast, between high masses of ground-ice, which frequently had the most picturesque forms. Later in the day we again fell in



PIECES OF ICE FROM THE COAST OF THE CHUKCHI PENINSULA.

(After a drawing by O. Nordquist.)

with very low ice formed in rivers and shut-in inlets of the sea, and came into slightly salt water having a temperature above the freezing-point.

After having been moored during the night to a large piece of ground-ice, the *Vega* continued her course on the 20th September almost exclusively among low, dirty ice, which had not been much pressed together during the preceding winter. This ice was not so deep in the water as the blue ground-ice, and could therefore

drift nearer the coast, a great inconvenience for our vessel, which drew so much water. We soon came to a place where the ice was packed so close to land that an open channel only $11\frac{1}{2}$ to $14\frac{1}{2}$ feet deep remained close to the shore. We were therefore compelled after some hours' sailing to lie to at ground-ice to await more favourable circumstances. The wind had now gone from west to north and north-west. Notwithstanding this the temperature became milder and the weather rainy, a sign that great open stretches of water lay to the north and north-west of us. During the night before the 21st it rained heavily, the wind being N.N.W. and the temperature $+ 2^{\circ}$ C. An attempt was made on that day to find some place where the belt of drift-ice that was pressed against the land could be broken through, but it was unsuccessful, probably in consequence of the exceedingly dense fog which prevailed.

Dredging gave but a scanty yield here, probably because the animal life in water so shallow as that in which we were anchored, is destroyed by the ground-ice, which drifts about here for the greater part of the year. Excursions to the neighbouring coast on the other hand, notwithstanding the late season of the year, afforded to the botanists of the *Vega* valuable information regarding the flora of the region.

On the 22nd I made, along with Captain Palander, an excursion in the steam launch to take soundings farther to the east. We soon succeeded in discovering a channel of sufficient depth and not too much blocked with ice, and on the 23rd the *Vega* was able to resume her voyage among very closely packed drift-ice, often so near the land that she had only a fourth of a metre of water under her keel. We went forward however, if slowly.

The land here formed a grassy plain, still clear of snow, rising inland to gently sloping hills or earthy heights. The beach was strewn with a not inconsiderable quantity of driftwood, and here and there were seen the remains of old dwelling-places. On the evening of the 23rd September we lay to at ground-ice in a pretty large opening of the ice-field. This opening closed in the course of the night, so that on the 24th and 25th we could make only very little progress, but on the 26th we continued our course, at

first with difficulty, but afterwards in pretty open water to the headland which on the maps is called Cape Onman. The natives too, who came on board here, gave the place that name. The ice we met with on that day was heavier than before, and bluish-white, not dirty. It was accordingly formed farther out at sea.

On the 27th we continued our course in somewhat open water to Kolyuchin Bay. No large river debouches in the bottom of this great fiord, the only one on the north coast of Asia which, by its long narrow form, the configuration of the neighbouring shores, and its division into two at the bottom, reminds us of the Spitzbergen fiords which have been excavated by glaciers. The mouth of the bay was filled with very closely packed drift-ice that had gathered round the island situated there, which was inhabited by a large number of Chukchi families. In order to avoid this ice the *Vega* made a considerable *détour* up the fiord. The weather was calm and fine, but new ice was formed everywhere among the old drift-ice where it was closely packed. Small seals swarmed by hundreds among the ice, following the wake of the vessel with curiosity. Birds on the contrary were seen in limited numbers. Most of them had evidently already migrated to more southerly seas. At 4.45 p.m. the vessel was anchored to an ice-floe near the eastern shore of the fiord. It could be seen from this point that the ice at the headland, which bounded the mouth of the fiord to the east, lay so near land that there was a risk that the open water next the shore would not be deep enough for the *Vega*.

Lieutenant Hovgaard was therefore sent with the steam launch to take soundings. He returned with the report that the water off the headland was sufficiently deep. At the same time, accompanied by several of the naturalists, I made an excursion on land. In the course of this excursion the hunter Johnsen was sent to the top of the range of heights which occupied the interior of the promontory, in order to get a view of the state of the ice farther to the east. Johnsen too returned with the very comforting news that a very broad open channel extended beyond the headland along the coast to the south-east. I was wandering about along with my comrades on the slopes near the beach in order, so far as the falling darkness permitted, to examine its

natural conditions, when Johnsen came down; he informed us that from the top of the height one could hear bustle and noise and see fires at an encampment on the other side of the headland. He supposed that the natives were celebrating some festival. I had a strong inclination to go thither, in order, as I thought, "to take farewell of the Chukches," for I was quite certain that on some of the following days we should sail into the Pacific. But it was already late in the evening and dark, and we were not yet sufficiently acquainted with the disposition of the Chukches to go by night, without any serious occasion, in small numbers and provided only with the weapons of the chase, to an encampment with which we were not acquainted. It was not until afterwards that we learned that such a visit was not attended with any danger. Instead of going to the encampment, as the vessel in any case could not weigh anchor this evening, we remained some hours longer on the beach and lighted there an immense log fire of drift-wood, round which we were soon all collected, chatting merrily about the remaining part of the voyage in seas where not cold but heat would trouble us, and where our progress at least would not be obstructed by ice, continual fog, and unknown shallows. None of us then had any idea that, instead of the heat of the tropics, we would for the next ten months be experiencing a winter at the pole of cold, frozen in on an unprotected road, under almost continual snow-storms, and with a temperature which often sank below the freezing-point of mercury.

The evening was glorious, the sky clear, and the air so calm that the flames and smoke of the log fire rose high against the sky. The dark surface of the water, covered as it was with a thin film of ice, reflected its light as a fire-way straight as a line, bounded far away at the horizon by a belt of ice, whose inequalities appeared in the darkness as the summits of a distant high mountain chain. The temperature in the quite draught-free air was felt to be mild, and the thermometer showed only 2° under the freezing-point. This slight degree of cold was however sufficient to cover the sea in the course of the night with a sheet of newly-frozen ice, which, as the following day's experience showed, at the opener places could indeed only delay, not obstruct

the advance of the *Vega*, but which however bound together the fields of drift-ice collected off the coast so firmly that a vessel, even with the help of steam, could with difficulty force her way through.

When on the following day, the 28th September, we had sailed past the headland which bounds Kolyuchin Bay on the east, the channel next the coast, clear of drift-ice, but covered with newly formed ice, became suddenly shallow. The depth was too small for the *Vega*, for which we had now to seek a course among the blocks of ground-ice and fields of drift-ice in the offing. The night's frost had bound these so firmly together that the attempt failed. We were thus compelled to lie to at ground-ice all the more certain of getting off with the first shift of the wind, and of being able to traverse the few miles that separated us from the open water at Behring's Straits, that whalers on several occasions had not left this region until the middle of October.

CHAPTER VIII.

Wintering becomes necessary—The position of the *Vega*—The ice round the vessel—American ship in the neighbourhood of the *Vega* when frozen in—The nature of the neighbouring country—The *Vega* is prepared for wintering—Provision-depôt and observatories established on land—The winter dress—Temperature on board—Health and dietary—Cold, wind, and snow—The Chukches on board—Menka's visit—Letters sent home—Nordquist and Hovgaard's excursion to Menka's encampment—Another visit of Menka—The fate of the letters—Nordquist's journey to Pidlin—Find of a Chukchi grave—Hunting—Scientific work—Life on board—Christmas Eve.

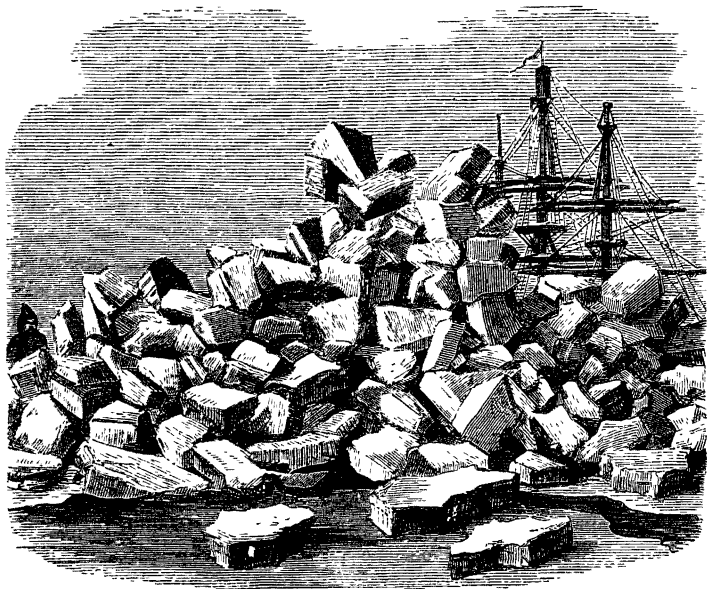
ASSURED that a few hours' southerly wind would be sufficient to break up the belt of ice, scarcely $6\frac{1}{2}$ miles in breadth, that barred our way, and rendered confident by the communications from experts in America concerning the state of the ice in the sea north of Behring's Straits, I was not at first very uneasy at the delay, of which we took advantage to make short excursions on land and hold converse with the inhabitants. First, when day after day passed without any change taking place, it became clear to me that we must make preparations for wintering just on the threshold between the Arctic and the Pacific Oceans. It was an unexpected disappointment, which it was more difficult to bear with equanimity, since it was evident that we would have avoided it if we had come some hours earlier to the eastern side of Kolyuchin Bay. There were numerous occasions during the preceding part of our voyage on which these hours might have been saved.

The position of the vessel was by no means very secure. For

the *Vega*, when frozen in, as appears from the sketch map to be found further on, did not lie at anchor in any haven, but was only in the expectation of finding a favourable opportunity to steam on, anchored behind some ground-ice, which had stranded in a depth of thirty-one feet, some 1,530 yards from land, in a road which was quite open from true N. 74° W. by north to east. The vessel had here no other protection against the violent ice-pressure which winter storms are wont to cause in the Polar seas, than a rock of ice stranded at high water, and therefore also at high water not very securely fixed. Fortunately the tide just on the occasion of our being frozen in, appears to have been higher than at any other time during the course of the winter. The ice-rocks, therefore, first floated again far into the summer of 1879, when their parts that projected above the water had diminished by melting. Little was wanting besides to make our winter haven still worse than it was in reality. For the *Vega* was anchored the first time on the 28th September at some small ice-blocks which had stranded 200 yards nearer the land, but was removed the following day from that place, because there were only a few inches of water under her keel. Had the vessel remained at her first anchorage, it had gone ill with us. For the newly formed ice, during the furious autumn storms, especially during the night between the 14th and 15th December, was pressed over these ice-blocks. The sheet of ice, about half a yard thick, was thereby broken up with loud noise into thousands of pieces, which were thrown up on the underlying ground-ices so as to form an enormous *toross*, or rampart of loose, angular blocks of ice. A vessel anchored there would have been buried under pieces of ice, pressed aground, and crushed very early in the winter.

When the *Vega* was beset, the sea near the coast, as has been already stated, was covered with newly-formed ice, too thin to carry a foot passenger, but thick enough to prevent the passage of a boat. In the offing lay, as far as the eye could see, closely packed drift-ice, which was bound together so firmly by the newly formed ice, that it was vain to endeavour to force a passage. Already, by the 2nd October, it was possible, by observing the

necessary precautions, to walk upon the newly formed ice nearest the vessel, and on the 3rd October the Chukches came on board on foot. On the 10th there were still weak places here and there between the vessel and the land, and a blue sky to the eastward indicated that there was still open water in that direction. That this "clearing" was at a considerable distance from the vessel



TOROSS.

From the neighbourhood of the *Vega's* winter quarters.

was seen from an excursion which Dr. Almquist undertook in a north-easterly direction on the 13th October, when, after walking about twelve miles over closely packed drift-ice, he was compelled to turn without having reached the open water. It was clear that the *Vega* was surrounded by a band, at least eighteen miles broad, of drift-ice fields, united by newly formed ice, which in the course of the winter reached a considerable thickness.

In this immense ice-sheet there often arose in the course of the winter cracks of great length. They ran uninterruptedly across newly formed ice-fields, and old, high ground-ice. One of the largest of these cracks was formed on the night before the 15th December right under the bow of the vessel. It was nearly a yard broad, and very long. Commonly the cracks were only an inch or two broad, but, notwithstanding this, they were troublesome enough, because the sea-water forced itself up through them to the surface of the ice and drenched the snow lying next to it.

Up to a distance of about three miles and a half from the shore the ice lay during the course of the whole winter nearly undisturbed, with the exception of the small cracks just mentioned. Farther out to sea, on the other hand, it was in constant motion. So-called *polynias* or open places probably occur here all the year round, and when the weather was favourable we could therefore nearly always see a blue water sky at the horizon from true N.W. to E. A southerly wind after some days brought the open water channel so near the vessel that it was possible to walk to it in a few hours. It then swarmed with seals—an indication that it was in connection with a sea that was constantly open. The neighbourhood of such a sea perhaps also accounts for the circumstance that we did not see a single seal-hole in the ice-fields that surrounded the vessel.

The ground-ice, to which the *Vega* was moored on the 29th September, and under which she lay during the course of the winter, was about forty-four yards long and twenty-seven yards broad; its highest point lay $19\frac{1}{2}$ feet above the surface of the water. It was thus not very large, but gave the vessel good shelter. This ground-ice, along with the vessel and the newly formed ice-field lying between it and the shore, was indeed moved considerably nearer land during the violent autumn storms. A groan or two and a knocking sound in the hull of the vessel indicated that it did not escape very severe pressure; but the *Vega* did not during the course of the winter suffer any damage, either from this or from the severe cold, during which sharp reports often indicated that some crack in the wood-work

had widened through the freezing of the water that had made its way into the vessel. In consequence of iron contracting more than wood under the influence of cold, the heads of the iron bolts, with which the ship's timbers were fastened together, in the course of the winter sank deep into the outside planking. But no serious leak arose in this way, perhaps because the cold only acted on that part of the vessel which lay above the surface of the water.

Already during the first days of our wintering we interpreted various lively accounts of the natives, which they illustrated by signs, to mean that a whaler would be found at Serze Kamen, in the neighbourhood of the *Vega's* winter haven. On this account Lieutenant Brusewitz was sent out on the 4th October with two men and the little boat, *Louise*, built in Copenhagen for the expedition of 1872-73, and intended for sledge journeys, with instructions to ascertain, if possible, if such was the case. He returned late at night the same day without having got sight of any vessel. We now supposed that the whole depended on our having misunderstood the accounts of the Chukches. But a letter which I received after our return, from Mr. W. BARTLETT, dated New Bedford, 6th January, 1880, shows that this had not been the case. The schooner *W. M. Meyer* lay at Serze Kamen two days after we anchored in our winter haven. The distance between the two places is only about forty-three miles.

The winter haven was situated in $67^{\circ} 4' 49''$ north latitude, and $173^{\circ} 23' 2''$ longitude west from Greenwich, 1,530 yards from land. The distance from East Cape was 120 nautical miles, and from Point Hope near Cape Lisburn on the American side, 180 nautical miles.

The neighbouring land formed a plain rising gradually from the sea, slightly undulating and crossed by river valleys, which indeed when the *Vega* was frozen in was covered with hoarfrost and frozen, but still clear of snow, so that our botanists could form an idea of the flora of the region, previously quite unknown. Next the shore were found close beds of *Elymus*, alternating with carpets of *Halianthus peploides*, and further up a poor, even, gravelly soil, covered with water in spring, on which grew only

a slate-like lichen, *Gyrophora proboscidea*, and a few flowering plants, of which *Armeria sibirica* was the most common. Within the beach were extensive salt and fresh-water lagoons, separated by low land, whose banks were covered with a pretty luxuriant carpet, formed of mosses, grasses, and Carices. But first on the neighbouring high land, where the weathered gneiss strata yielded a more fertile soil than the sterile sand thrown up out of the sea, did the vegetation assume a more variegated stamp. No trace of trees¹ was indeed found there, but low willow bushes, extensive carpets of *Empetrum nigrum* and *Andromeda tetragona* were seen, along with large tufts of a species of *Artemisia*. Between these shoot forth in summer, to judge partly from the dried and frozen remains of plants which Dr. Kjellman collected in autumn, partly from collections made in spring, a limited number of flowering plants, some of which are well known at home, as the red whortleberry, the cloudberry, and the dandelion.

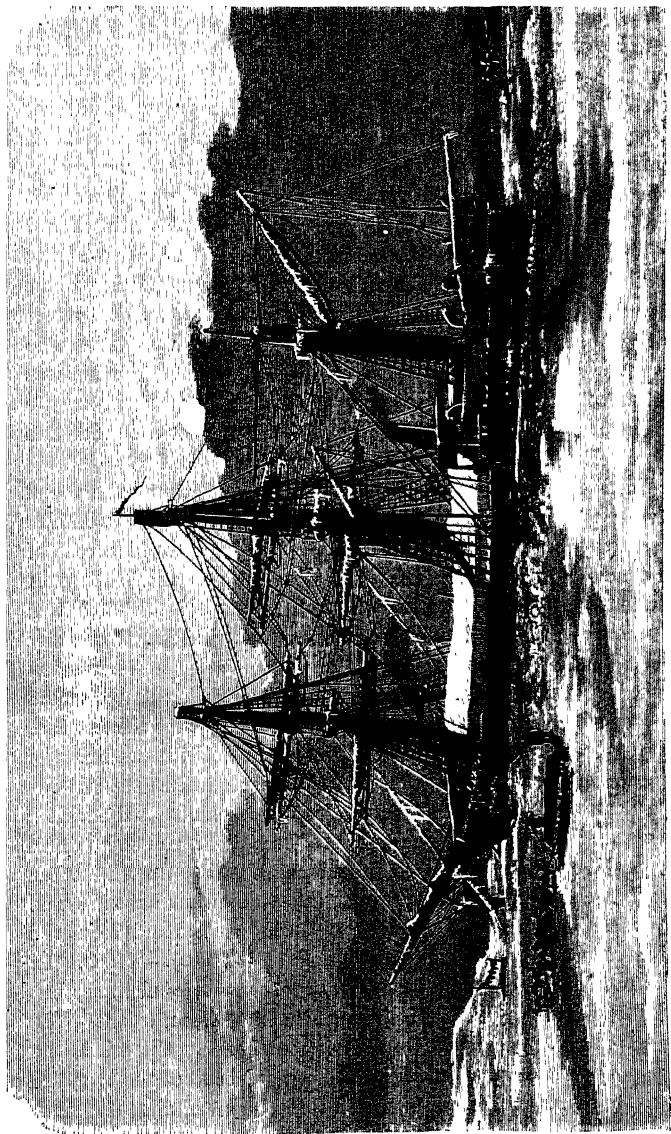
Although experience from preceding Polar journeys and specially from the Swedish expedition of 1872-73, showed that even at the 80th degree of latitude the sea may suddenly break up in the middle of winter, we however soon found, as has been already stated, that we must make preparations for wintering. The necessary arrangements were accordingly made. The snow which collected on deck, and which at first was daily swept away, was allowed to remain, so that it finally formed a layer twelve inches thick, of hard tramped snow or ice, which in no inconsiderable degree contributed to increase the resistance of the deck to cold, and for the same purpose snowdrifts were thrown up along the vessel's sides. A stately ice stair was carried up from the ice to the starboard gunwale. A large tent made for the purpose at Karlskrona was pitched from the bridge to the fore, so that only the poop was open. Aft the tent was quite open, the blast and drifting snow having also free entrance from the sides and from an incompletely closed opening in the fore. The protection it yielded against the cold was indeed greatly diminished in this way, but instead it did not have the

¹ Low brush is probably to be met with in the interior of the Chukchi peninsula at places which are protected from the cold north winds.

least injurious action on the air on the vessel, a circumstance specially deserving of attention for its influence on the state of health on board. Often under this tent in the dark days of winter there blazed a brisk smithy fire, round which the Chukches crowded in curious wonder at the skill with which the smith fashioned the glowing iron. Here the cook dealt out to the Chukches the soup and meat that were left over, and the loaves of bread which at every baking were baked for them. Here was our reception saloon, where tobacco and sugar were distributed to the women and children, and where sometimes, if seldom, a frozen hunter or fisherman was treated to a little spirits. Here pieces of wood and vertebræ of the whale were valued and purchased, and here tedious negotiations were carried on regarding journeys in dog-sledges in different directions.

The violent motion which took place in the ice during the night before the 15th December, gave us a sharp warning that our position in the open road was by no means so secure as was desirable, but that there was a possibility that the vessel might be nipped suddenly and without any previous warning. In order as far as possible to secure ourselves against the consequences of such a misfortune, a depôt of provisions, guns, ammunition, &c., reckoned for 30 men and 100 days, was formed on land. Fortunately we did not require to depend upon it. The stores were laid up on the beach without the protection of lock or bolt, covered only with sails and oars, and no watch was kept at the place. Notwithstanding this, and the want of food which occasionally prevailed among the natives, it remained untouched both by the Chukches who lived in the neighbourhood, and by those who daily drove past the place from distant regions. All however knew very well the contents of the sail-covered heap, and they undoubtedly supposed that there were to be found there treasures of immense value, and provisions enough for the whole population of the Chukch peninsula for a whole year.

The Magnetical Observatory was erected upon the beach a mile from the vessel. To this house the observers had to walk to and fro at least four times in the twenty-four hours over an



THE "VEGA" IN WINTER QUARTERS.
(After a photograph, taken in the spring of 1879 by L. Polander.)

ice-field, covered with loose snow, as fine as dust, that was set in motion by the least puff of wind, and then in a few moments completely obliterated every footprint. When the moon did not shine, the winter nights were so dark, that it was impossible to distinguish the very nearest objects, and day after day during the course of the winter we had, besides, drifting snow so thick that the high dark hull of the vessel itself could be distinguished only when one was in its immediate neighbourhood! In walking from land during the darkness of the night and in drifting snow it would have been very difficult to find one's way to the vessel without guidance, and he would have been helplessly lost who went astray. To prevent such an accident, the precaution was taken of running a line over high ice-pillars between the Observatory and the vessel. Even with the help of the guide-line it was often difficult enough to find our way.

The attempt to keep open a channel in the ice round the vessel during the whole winter had soon to be given up, but two holes were kept constantly open, one by the side of the vessel in case of fire, and the other for the tidal observations which Captain Palander set on foot during the winter. The latter hole was chosen by a little seal as its haunt for a long time, until one day we entertained ourselves by catching him with the necessary care, and making him pay an involuntary visit on board, where he was offered various delicacies, which however were disregarded. The seal was let loose again in his hole, but notwithstanding the friendliness we showed him, he never more returned.

From the meteorological observations it appears that the winter was not so cold as the winters in the Franklin archipelago or in the coldest parts of the mainland of Siberia. On the other hand, it was exceedingly stormy at the *Vega's* winter station, and day after day, night after night, we have gone to and from the Observatory in a high wind and a cold of -30° to -46° C. In calm weather a cold of -40° is scarcely very troublesome, but with only a slight draught a degree of cold of for instance -35° is actually dangerous for one who goes against the wind, and without the necessary precautions exposes uncovered parts of the face, the hands, or the wrists, to the cold current of air. Without

one's being warned by any severe pain frostbite arises, which, if it be not in time thawed by rubbing the injured part with the hand, or with melting snow, may readily become very serious. Most of those who for the first time took part in a wintering in the high north, were, when the first cold occurred, more or less frostbitten, on several occasions so that there arose high frost-blisters filled with bloody water, an inch or two in extent, but fortunately never to such a degree that any serious bad results followed. After we, new-comers to the Polar regions, warned by experience, became more careful, such frostbites occurred but seldom. Nor did there occur a single case of frostbite in the feet. To this conduced our clothing, which was adapted to the climate, and, besides good winter clothes of the sort commonly used in Sweden, consisted of articles of dress brought with us specially for use in the high north.

On board the vessel in our cabins and collections-rooms it was besides by no means so cold as many would suppose. The sides of the vessel in several places indeed, especially in the cabins, were covered with a thick sheet of ice, and so was the skylight in the gun-room. But in the inhabited parts of the vessel we had, a little from the sides, commonly a temperature of $+12^{\circ}$ to $+17^{\circ}$ C, that is to say about the same as we in the north are wont to have indoors in winter, and certainly higher than the temperature of rooms during the coldest days of the year in many cities in the south, as for instance in Paris and Vienna. By night however the temperature in the cabins sank sometimes to $+5^{\circ}$ and $+10^{\circ}$, and the boarding at the side of the berth became covered with ice. In the work-room 'tweendecks the thermometer generally stood about $+10^{\circ}$, and even in the underhold, which was not heated, but lay under the water-line, the temperature was never under, commonly 1° or 2° above, the freezing-point.

Much greater inconvenience than from cold did we in the cabins suffer from the excessive heat and the fumes, which firing in large cast-iron stoves is wont to cause in small close rooms. When in the morning after a cold night the watch all too willingly obeyed the direction, which sounded from different quarters, to

fire well, one had often his wish so thoroughly satisfied, that, in



THE WINTER DRESS OF THE "VEGA" MEN.

half an hour after, every man lay bathed in perspiration. There

was no other help for it than to leave the cabin, take a cold bath and a good rub down, dress rapidly, rush on deck for fresh air, and cool in the temperature of -30° to -40° C. prevailing there. Other opportunities for bathing were also given both to the officers and crew, and the necessary care was taken to secure cleanliness, a sanitary measure which ought never to be neglected in Arctic winterings.

The state of health on board during the course of the winter was exceedingly good. Dr. Almquist's report enumerates only a few serious maladies, all successfully cured, among which may be mentioned stomach colds and slight cases of inflammation of the lungs, but not a single case of that insidious disease, scurvy, which formerly raged in such a frightful way among the crews in all long voyages, and which is still wont to gather so many victims from among Polar travellers.

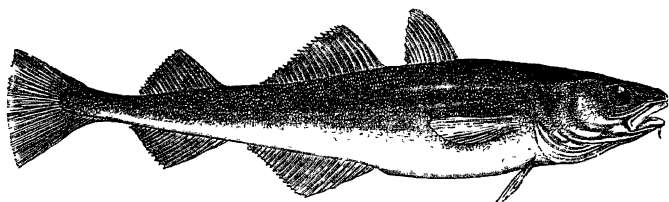
This good state of health depended in the first place on the excellent spirit which inspired the scientific men, the officers and the crew of the Expedition, but it ought also to be ascribed to the suitable equipment of the *Vega*, arranged by Captain Palander at Karlskrona, and above all to adjustment to the climate of our dietary, which was settled on the ground of the experience gained in the expedition of 1872-73, and after taking the advice of its distinguished physician Dr. Envall.

"Multegröt" (preserved cloudbberries), mixed with rum, was served out twice a week from the 15th February to the 1st April. I would willingly have had a larger quantity of this, according to northern experience, excellent antidote to scurvy, but as the cloudberry harvest completely failed in 1877, I could not, at any price, procure for the Expedition the quantity that was required. There was purchased in Finland instead, a large quantity of cranberry-juice, which was regularly served out to the crew and much liked by them. We carried with us besides a pair of living swine, which were slaughtered for the Christmas festivities.¹

¹ To carry animals for slaughter on vessels during Polar expeditions cannot be sufficiently recommended. Their flesh acts beneficially by forming a change from the preserved provisions, which in course of time become exceedingly disagreeable, and their care a not less important interruption to the monotony of the winter life.

All the men at that time had an opportunity of eating fresh pork twice a week, an invaluable interruption to the monotonous preserved provisions, which in its proportion conduced, during this festival, to which we inhabitants of the North are attached by so many memories, to enliven and cheer us.

The produce of hunting was confined during the course of the winter to some ptarmigan and hares, and thus did not yield any contribution worth mentioning to the provisioning of the vessel. On the other hand, I was able by barter with the natives to procure fish in considerable abundance, so that at certain seasons the quantity was sufficient to allow of fresh fish being served out once a week. The kind of fish which was principally obtained



COD FROM PITLEKAJ.
Gadus navaga, Kolreuter.
One-third the natural size.

during the winter, a sort of cod with greyish-green vertebræ, could however at first only be served in the gun-room, because the crew, on account of the colour of its bones, for a long time had an invincible dislike to it.

On much of the ground-ice in the neighbourhood of the vessel there were fresh-water collections of considerable depth, which indeed were already hard frozen on the surface, but long yielded us splendid water for drinking and washing. After the 14th of December, when all the smaller fresh-water collections were almost frozen to the bottom, and salt-water had made its way into the largest ones and those on which we most depended, it became necessary to procure water by melting ice.

The meteorological observations were made every fourth hour

up to the 1st November; after that to the 1st April every hour; after that again six times in the twenty-four hours. From the 27th November to the 1st April the thermometers were set up on land at the Magnetical Observatory; before and after that time in the immediate neighbourhood of the vessel. During winter the charge of the meteorological observations was intrusted to Dr. Stuxberg, who at that season, when all around us was covered with ice, was compelled to let his own zoological researches rest.

The state of the weather of course had a very sensible influence on our daily life, and formed the touchstone by which our equipment was tested. Space does not permit me to give in this work the detailed results of the meteorological observations. I shall therefore only state the following facts.

The greatest cold which was observed during the different months was in

October	the 24th	— 20°·8	March	the 29th	— 39°·8
November	the 30th	— 27°·2	April	the 15th	— 38°·0
December	the 23rd	— 37°·1	May	the 3rd	— 26°·8
January	the 25th	— 45°·7	June	the 3rd	— 14°·3
February	the 2nd	— 43°·8	July	the 2nd	— 1°·0

Twice we had the barometer uncommonly high, viz. :

On the 22nd December 6 a.m. 30·787 (0°) in.

On the 17th February 6 a.m. 31·037 (0°) in.

The lowest atmospheric pressure, 28·66 (0°) in., occurred on the 31st December at two o'clock p.m.

The weather during the winter was very stormy, and the direction of the wind nearest the surface of the earth almost constantly between north-west and north-north-west. But in atmospheric strata of inconsiderable height there prevailed, to judge by the direction of the clouds, a similar uninterrupted atmospheric current from the south-east, which when it occasionally sank to the surface of the earth brought with it air that was warmer and less saturated with moisture.

In our notes on the weather a difference was always made between *snöyra* (fall of snow in wind) and *yrsnö* (snow-storm without snow-fall). The fall of snow was not very great, but as there was in the course of the winter no thaw of such continuance that the snow was at any time covered with a coherent melted crust, a considerable portion of the snow that fell remained so loose that with the least puff of wind it was whirled backwards and forwards. In a storm or strong breeze the snow was carried to higher strata of the atmosphere, which was speedily filled with so close and fine snow-dust, that objects at the distance of a few metres could no longer be distinguished. There was no possibility in such weather of keeping the way open, and the man that lost his way was helplessly lost, if he could not, like the Chukchi snowed up in a drift, await the ceasing of the storm.

The humidity of the air was observed both by August's psychrometer and Saussure's hygrometer. But I do not believe that these instruments give trustworthy results at a temperature considerably under the freezing-point. Moreover the degree of humidity at the place where there can be a question of setting up a psychrometer and hygrometer during a wintering in the high north, has not the meteorological importance which has often been ascribed to it. In order to determine the true degree of humidity in the air, I would accordingly advise future travellers to these regions to weigh directly the water which a given measure of air contains by absorbing it in tubes with chloride of calcium, calcined sulphate of copper, or sulphuric acid.

The sandy neck of land which on the side next the vessel divided the lagoons from the sea, was bestrewn with colossal bones of the whale, and with the refuse of the Chukches, who had lived and wandered about there for centuries, and besides with portions of the skeleton of the seal and walrus, with the excreta of men, dogs, birds, &c. The region was among the most disagreeable I have seen in any of the parts inhabited by fishing Lapps, Samoyeds, Chukches, or Eskimo. When the *Vega* was beset there were two Chukchi villages on the neighbouring beach, of which the one that lay nearest our winter haven was

called Pitlekai. It consisted at first of seven tents, which in consequence of want of food their inhabitants removed gradually in the course of the winter to a region near Behring's Straits, where fish were more abundant. At the removal only the most indispensable articles were taken along, because there was an intention of returning at that season of the year when the chase again became more productive. The other encampment, Yinretlen, lay nearer the cape towards Kolyuchin Bay, and reckoned at the beginning of our wintering likewise seven tents, whose inhabitants appeared to be in better circumstances than those of Pitlekai. They had during the autumn made a better catch and collected a greater stock. Only some of them accordingly removed during winter.

The following encampments lay at a somewhat greater distance from our winter quarters, but so near, however, that we were often visited by their inhabitants :

Pidlin, on the eastern shore of Kolyuchin Bay, four tents.

Kolyuchin, on the island of the same name, twenty-five tents. This village was not visited by any of the members of the *Vega* Expedition.

Riraitinop, situated $3\frac{1}{2}$ miles east of Pitlekai, three tents.

Irgunnuk, four miles east of Pitlekai, ten tents, of which, however, in February only four remained. The inhabitants of the others had for the winter sought a better fishing place farther eastward.

The number of the persons who belonged to each tent was difficult to make out, because the Chukches were constantly visiting each other for the purpose of gossip and talk. On an average it may perhaps be put at five or six persons. Including the inhabitants of Kolyuchin Island, there thus lived about 300 natives in the neighbourhood of our winter quarters.

When we were beset, the ice next the shore, as has been already stated, was too weak to carry a foot passenger, and the difficulty of reaching the vessel from the land with the means which the Chukches had at their disposal was thus very great. When the natives observed us, there was in any case immediately a great commotion among them. Men, women, children, and

dogs were seen running up and down the beach in eager confusion ; some were seen driving in dog-sledges on the ice street next the sea. They evidently feared that the splendid opportunity which here lay before them of purchasing brandy and tobacco, would be lost. From the vessel we could see with glasses how several attempts were made to put out boats, but they were again given up, until at last a boat was got to a lane, clear of ice or only covered with a thin sheet, that ran from the shore to the



KAUTLJKAU, A CHUKCHI GIRL FROM IRGUNNUK

Front face and Profile.

(After photographs by L. Palander)

neighbourhood of the vessel. In this a large skin boat was put out, which was filled brimful of men and women, regardless of the evident danger of navigating such a boat, heavily laden through sharp, newly formed ice. They rowed immediately to the vessel, and on reaching it most of them climbed without the least hesitation over the gunwale with jests and laughter, and the cry *anoai anoai* (good day, good day). Our first meeting with the inhabitants of this region, where we afterwards passed ten

long months, was on both sides very hearty, and formed the starting-point of a very friendly relation between the Chukches and ourselves, which remained unaltered during the whole of our stay.

Regard for cleanliness compelled us to allow the Chukches to come below deck only exceptionally, which at first annoyed them much, so that one of them even showed a disposition to retaliate by keeping us out of the bedchamber in his tent. Our firmness on this point, however, combined with friendliness and generosity, soon calmed them, and it was not so easy for the men to exclude us from the inner tent, for in such visits we always had confections and tobacco with us, both for themselves and for the women and children. On board the vessel's tent-covered deck soon became a veritable reception saloon for the whole population of the neighbourhood. Dog-team after dog-team stood all day in rows, or more correctly lay snowed up before the ice-built flight of steps to the deck of the *Vega*, patiently waiting for the return of the visitors, or for the pemmican I now and then from pity ordered to be given to the hungered animals. The report of the arrival of the remarkable foreigners must besides have spread with great rapidity. For we soon had visits even from distant settlements, and the *Vega* finally became a resting-place at which every passer-by stopped with his dog-team for some hours in order to satisfy his curiosity, or to obtain in exchange for good words or some more acceptable wares a little warm food, a bit of tobacco, and sometimes when the weather was very stormy, a little drop of spirits, by the Chukches called *ram*, a word whose origin is not to be sought for in the Swedish-Norwegian *dram*, but in the English word *rum*.

All who came on board were allowed to go about without let or hindrance on our deck, which was encumbered with a great many things. We had not however to lament the loss of the merest trifle. Honesty was as much at home here as in the huts of the reindeer Lapps. On the other hand, they soon became very troublesome by their beggary, which was kept in bounds by no feeling of self-respect. Nor did they fail to take all possible advantage of what they doubtless considered the

great inexperience of the Europeans. Small deceptions in this way were evidently not looked upon as blameworthy, but as meritorious. Sometimes, for instance, they sold us the same thing twice over, they were always liberal in promises which they never intended to keep, and often gave deceptive accounts of articles which were exposed for sale. Thus the carcasses of foxes were offered, after having been flayed and the head and feet cut off, on several occasions as hares, and it was laughable to see their astonishment at our immediately discovering the fraud. The Chukches' complete want of acquaintance with money and our small supply of articles for barter for which they had a liking besides compelled even me to hold at least a portion of our wares at a high price. Skins and blubber, the common products of the Polar lands, to the great surprise of the natives, were not purchased on the *Vega*. On the other hand a complete collection of weapons, dresses, and household articles was procured by barter.

As the Chukches began to acquire a taste for our food, they never neglected, especially during the time when their hunting failed, to bring daily on board driftwood and the vertebræ and other bones of the whale. They bartered these for bread. So considerable a quantity of food was distributed partly as payment for services rendered or for goods purchased, partly as gifts, that we contributed in a very great degree to mitigate the famine which during midwinter threatened to break out among the population.

None of the natives in the neighbourhood of the *Vega's* winter station professed the Christian religion. None of them spoke any European language, though one or two knew a couple of English words and a Russian word of salutation. This was a very unfortunate circumstance, which caused us much trouble. But it was soon remedied by Lieut. Nordquist specially devoting himself to the study of their language, and that with such zeal and success that in a fortnight he could make himself pretty well understood. As a fruit of his studies Lieut. Nordquist has drawn up an extensive vocabulary of this little known language, and given a sketch of its grammatical structure. The knowledge

of the Chukchi language, which the other members of the Expedition acquired, was confined to a larger or smaller number of words; the natives also learned a word or two of our language, so that a *lingua franca* somewhat intelligible to both parties gradually arose, in which several of the crew soon became very much at home, and with which in case of necessity one could get along very well, although in this newly formed dialect all grammatical inflections were totally wanting. Besides, I set one of the crew, the walrus-hunter Johnsen, free for a considerable time from all work on board, in order that he might wander about the country daily, partly for hunting, partly for conversing with the natives. He succeeded in the beginning of winter in killing some ptarmigan and hares, got for me a great deal of important information regarding the mode of life of the Chukches, and procured several valuable ethnographical objects. But after a time, for what reason I could never make out, he took an invincible dislike to visit the Chukchi tents more, without however having come to any disagreement with their inhabitants.

On the 5th October the openings between the drift-ice fields next the vessel were covered with splendid skating ice, of which we availed ourselves by celebrating a gay and joyous skating festival. The Chukchi women and children were now seen fishing for winter roach along the shore. In this sort of fishing a man, who always accompanies the fishing women, with an iron-shod lance cuts a hole in the ice so near the shore that the distance between the under corner of the hole and the bottom is only half a yard. Each hole is used only by one woman, and that only for a short time. Stooping down at the hole, in which the surface of the water is kept quite clear of pieces of ice by means of an ice-sieve, she endeavours to attract the fish by means of a peculiar wonderfully clattering cry. First when a fish is seen in the water an angling line, provided with a hook of bone, iron or copper, is thrown down, strips of the entrails of fish being employed as bait. A small yard-long staff with a single or double crook in the end was also used as a fishing implement. With this little fish-spear the men cast up fish on the ice with



CHURCH'S ANGLING.

incredible dexterity. When the ice became thicker, this fishing was entirely given up, while during the whole winter a species of cod and another of grayling were taken in great quantity in a lagoon situated nearer Behring's Straits. The coregonus is also caught in the inland lakes, although, at least at this season of the year, only in limited quantity.

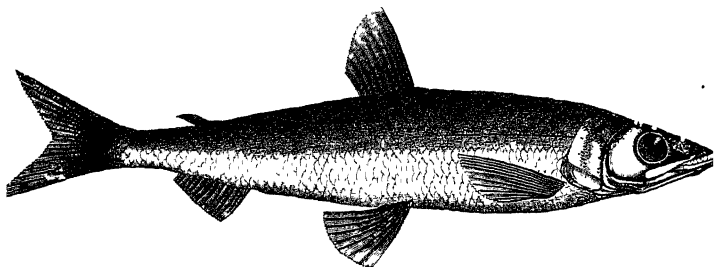
On the morning of the 6th October, we saw from the vessel an extraordinary procession moving forward on the ice. A number of Chukches drew a dog-sledge on which lay a man. At first we supposed it was a man who was very ill, and who came to seek the help of the physician, but when the procession reached the vessel's side, the supposed invalid climbed very nimbly up the ice-covered rope-ladder (our ice-stair was not yet in order), stepped immediately with a confident air, giving evidence of high rank, upon the half-deck, crossed himself, saluted graciously, and gave us to know in broken Russian that he was a man of importance in that part of the country. It now appeared that we were honoured with a visit from the representative of the Russian empire, VASSILI MENKA, the starost among the reindeer Chukches. He was a little dark man, with a pretty worn appearance, clad in a white variegated "pesk" of reindeer skin, under which a blue flannel shirt was visible. In order immediately on his arrival to inspire us with respect, and perhaps also in order not to expose his precious life to the false Ran's treachery, he came to the vessel over the yet not quite trustworthy ice, riding in a sledge that was drawn not by dogs but by his men. On his arrival he immediately showed us credentials of



ICE SLICE.
One-eighth of the natural size.

his rank, and various evidences of the payment of tribute (or market tolls), consisting of some few red and some white fox-skins, reckoning the former at one rouble eighty copecks, the latter at forty copecks each.

He was immediately invited down to the gunroom, entertained after the best of our ability, and bothered with a number of questions which he evidently understood with difficulty, and answered in very unintelligible Russian. He was in any case the first with whom some of us could communicate, at least in a way. He could neither read nor write. On the other hand, he could quickly comprehend a map which was shown him, and



SMELT FROM THE CHUKCH PENINSULA.

Osmerus eperlanus, Lin.

One-third the natural size.

point out with great accuracy a number of the more remarkable places in north-eastern Siberia. Of the existence of the Russian emperor the first official of the region had no idea; on the other hand, he knew that a very powerful person had his home at Irkutsk. On us he conferred the rank of "Ispravnik" in the neighbouring towns. At first he crossed himself with much zeal before some photographs and engravings in the gunroom, but he soon ceased when he observed that we did not do likewise. Menka was accompanied by two badly-clad natives with very oblique eyes, whom we took at first for his servants or slaves. Afterwards we found that they were owners of reindeer, who

considered themselves quite as good as Menka himself, and further on we even heard one of them speak of Menka's claim to be a chief with a compassionate smile. Now, however, they were exceedingly respectful, and it was by them that Menka's gift of welcome, two reindeer roasts, was carried forward with a certain stateliness. As a return present we gave him a woollen shirt and



VASSILI MENKA

Starost among the Reindeer Chukches

(After a photograph by L. Palander)

some parcels of tobacco. Menka said that he should travel in a few days to Markova, a place inhabited by Russians on the river Anadyr, in the neighbourhood of the old Anadyrsk. Although I had not yet given up hope of getting free before winter, I wished to endeavour to utilise this opportunity of sending home accounts of the *Vega's* position, the state of matters on board, &c. An open letter was therefore written in Russian, and addressed

to his Excellency the Governor-General at Irkutsk, with the request that he would communicate its contents to his Majesty, King Oscar. This was placed, along with several private sealed letters, between a couple of pieces of board, and handed over to Menka with a request to give them to the Russian authorities at Markova. At first it appeared as if Menka understood the letter as some sort of further credentials for himself. For when he landed he assembled, in the presence of some of us, a circle of Chukches round himself, placed himself with dignity in their midst, opened out the paper, but so that he had it upside down, and read from it long sentences in Chukchi to an attentive audience, astonished at his learning. Next forenoon we had another visit of the great and learned chief. New presents were exchanged, and he was entertained after our best ability. Finally he danced to the chamber-organ, both alone and together with some of his hosts, to the great entertainment of the Europeans and Asiatics present.

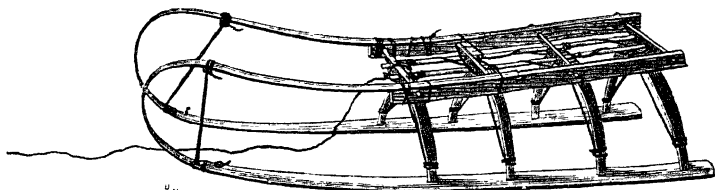
As the state of the ice was still unaltered, I did not neglect the opportunity that now offered of making acquaintance with the interior of the country. With pleasure, accordingly, I gave Lieutenants Nordquist and Hovgaard permission to pay a visit to Menka's encampment. They started on the morning of the 8th October. Lieutenant Nordquist has given me the following account of their excursion :—

“On Tuesday, the 8th October, at 10 o'clock a.m., Lieut. Hovgaard and I travelled from Pitlekai in dog-sledges into the interior in a S.S.E. direction. Hovgaard and I had each a Chukchi as driver. Menka had with him a servant, who almost all the time ran before as guide. My comrade's sledge, which was heaviest, was drawn by ten dogs, mine by eight, and Menka's, which was the smallest and in which he sat alone, by five. In general the Chukches appear to reckon four or five dogs sufficient for a sledge with one person.

“The *tundra*, with marshes and streams scattered over it, was during the first part of our way only gently undulating, but the farther we went into the interior of the country the more uneven it became, and when, at 8 o'clock next morning, we reached the goal of our journey—Menka's brother's camp—we found ourselves

in a valley surrounded by hills, some of which rose about 300 metres above their bases. A portion of the vegetable covering the *tundra* could still be distinguished through the thin layer of snow.

"When, on the morning of the 9th, we came to the camp, there met us some of the principal Chukches. They saluted Menka in the Russian way, by kissing him first on both cheeks and then on the mouth. The Chukches, however, appear to be very averse to this ceremony, and scarcely ever touched each other with the mouth. Us they saluted in the common way, by stretching out the hand and bowing themselves. We then went into Menka's brother's tent, in front of which the whole inhabitants of the encampment were speedily assembled to look at us. The camp consisted of eighteen tents, pitched on both sides of a river which ran through the valley. The tents were inhabited by reindeer-Chukches, who carry on traffic between the Russians and a tribe living on the other side of Behring's Straits whom they call *Yekargaules*. Between the tents



CHUKCHI DOG-SLEDGE

we saw a great number of sledges, both empty and loaded. Some of these were light and low sledges for driving in, with runners bent upwards and backwards, others were heavier pack-sledges, made of stronger wood, with the runners not bent back. Some of the light sledges were provided with tilts of splints covered with reindeer skins; others were completely covered, having an entrance only in front.

"The knives, axes, boring tools, &c., which I saw were of iron and steel, and had evidently been obtained from Americans or Russians. The household articles in Menka's brother's tent consisted of some copper coffee-pots, which were used for boiling water, a german-silver beaker with an English inscription, two tea-cups with saucers, flat wooden trays, and barrels. The dress of the reindeer-Chukches is similar to that of the coast-Chukches, only with this difference, that the former use reindeer-skins

exclusively, while the latter employ seal-skin in addition. Some, on our arrival, put on blouses of variegated cloth, probably of Russian manufacture. Among ornaments may be mentioned glass-beads, strung on sinews, which were worn in the ears or on the neck, chiefly by the women. These were tattooed in the same way as those of the coast-Chukches. I saw here, however, an old woman, who, besides the common tattooing of the face, was tattooed on the shoulders, and another, who, on the outside of the hands, had two parallel lines running along the hand and an oblique line connecting them. The men were not tattooed. Two of them carried crosses, with Slavonic inscriptions, at the neck, others carried in the same way forked pieces of wood. Whether these latter are to be considered as their gods or as amulets I know not.

“As we could not obtain here the reindeer that we wished to purchase on account of the expedition, we betook ourselves with our dogs on the afternoon of the same day along with Menka to his son-in-law's encampment, which we reached at 8 o'clock in the evening. We were received in a very friendly way, and remained here over night. All the inhabitants of the tent sleep together in the bedchamber of it, which is not more than 2 to $2\frac{1}{2}$ yards long, 2 yards broad, and $1\frac{1}{3}$ to $1\frac{1}{2}$ yards high. Before they lie down they take supper. Men and women wear during the night only a *cingulum pudicitie*, about 6 inches broad, and are otherwise completely naked. In the morning the housewife rose first and boiled a little flesh, which was then served in the bedchamber, before its inmates had put on their clothes. She cut the meat in slices in a tray, and distributed them afterwards. In the morning we saw the Chukches catch and slaughter their reindeer. Two men go into the herd, and when they have got sight of a reindeer which they wish to have, they cast, at a distance of nine or ten metres, a running noose over the animal's horns. It now throws itself backwards and forwards in its attempts to escape, and drags after it for some moments the man who holds the noose. The other man in the meantime endeavours to approach the reindeer, catches the animal by the horns and throws it to the ground, killing it afterwards by a knife-stab behind the shoulder. The reindeer is then handed over to the women, who, by an incision in the side of the belly, take out the entrails. The stomach is emptied of its contents, and is then used to hold the blood. Finally the skin is taken off.

“About 10 o'clock a.m. we commenced our homeward journey.

At nightfall we sought to have a roof over our head in a wretched Chukchi tent on the shore of Lake Uchunuch. It was partly sunk in one of the small mounds which are found here along the shore, and which are probably the remains of old Onkilon dwellings. The present inhabitants, two old men and an old woman, had their habitation arranged in the following way :—In the bottom of a cylindrical pit, 3 feet deep and $11\frac{1}{2}$ to $14\frac{1}{2}$ feet in diameter, a vertical pole was erected, against the upper end of which rested a number of obliquely placed bars, rising from the edge of the pit, which were covered with skins. The inclosure or bedchamber peculiar to the Chukchi tent was not wanting here. Otherwise the whole dwelling bore the stamp of poverty and dirt. The food of the inmates appeared to be fish. Of this, besides the fish we obtained here, the nets hanging in front of the tent afforded evidence. Some clothes, an iron pot, two wooden vessels, and a Shaman drum were the only things I could discover in the tent.

“Next morning we continued our journey. On the other side of Lake Uchunuch we saw two dwellings which only consisted of boats turned upside down with some hides drawn over them. The rest of the way we came past Naitskai and through Irgunnuk, where we were received in an exceedingly friendly fashion. By 7 o'clock in the evening of the 11th October we were again on board the *Vega*.”

Nordquist brought with him, among other things, two reindeer, bought for a rouble and a half each. They were still very serviceable, though badly slaughtered. But the reindeer we purchased farther on in the winter were so poor that no one on board could persuade himself to eat them.

On the 18th October, by which time we believed that Menka would be already at Markova, we were again visited by him and his son-in-law. Our miscalculation with respect to the letters, made his reception on this occasion less hearty, and he therefore left us soon. After our return to the world of newspapers we found that Menka had actually executed his commission. He, however, did not reach Anadyrsk until the 7th March = 23rd February. Thence the packet was sent to Irkutsk, arriving there on the 10th May = 28th April. The news reached Sweden by telegraph six days after, on the 16th May, just at a time when

concern for the fate of the *Vega* was beginning to be very great, and the question of relief expeditions was seriously entertained.

On the 10th October, the new ice at many places in the neighbourhood of the vessel was still so weak that it was impossible to walk upon it, and blue water-skies at the horizon indicated that there were still considerable stretches of open water in the neighbourhood. But the drift-ice round about us lay so rock-fast, that I could already take solar altitudes from the deck of the vessel with a mercurial horizon. In order to ascertain the actual state of the case with reference to the open water, excursions were undertaken on the 13th October, in different directions. Dr. Kjellman could then, from the rocky promontory at Yinretlen, forty-two metres high, see large open spaces in the sea to the northward. Dr. Almquist went right out over the ice, following the track of Chukches, who had gone to catch seals. He travelled about twelve miles over closely packed drift-ice fields, without reaching open water, and found the newly frozen ice, with which the pieces of drift-ice were bound together, still everywhere unbroken. The Chukches, who visited the vessel in dog-sledges on the 28th October, informed us, however, that the sea a little to the east of us was still completely open.

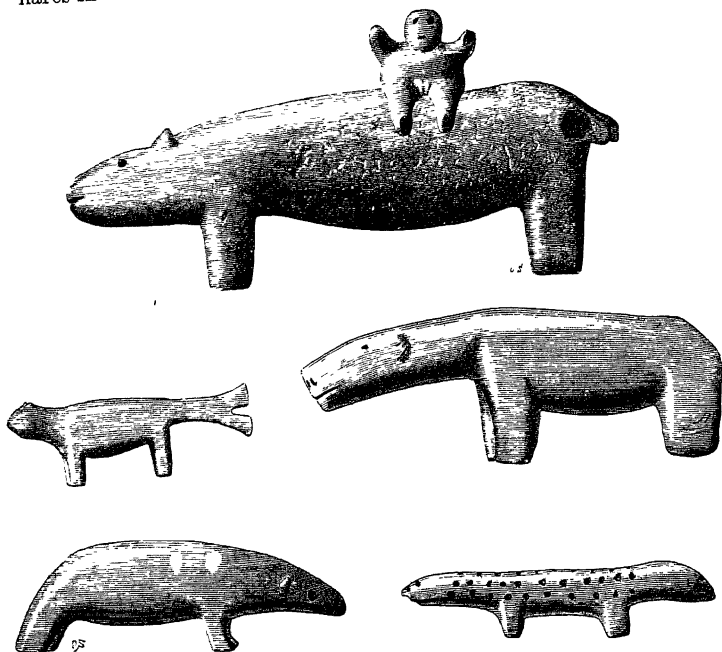
On the 15th October the hunter Johnsen returned from a hunting expedition quite terrified. He informed us that during his wanderings on the *tundra*, he had found a murdered man, and brought with him, with the idea that, away here in the land of the Chukches similar steps ought to be taken as in those lands which are blessed by a well-ordered judicial system, as *species facti*, some implements lying beside the dead man, among which was a very beautiful lance, on whose blade traces of having been inlaid in gold could still be discovered. Fortunately he had come with these things through the Chukchi camp unobserved. From the description which was given me, however, I was able immediately to come to the conclusion that the question here was not of any

¹ The King of Sweden has since ordered a gold medal to be given to Vassili Menka in recognition of the fidelity with which he executed the commission of carrying our letters to a Russian post station.

murder, but of a dead man laid out on the *tundra*. I requested Dr. Almquist to visit the place, in order that he might make a more detailed examination. He confirmed my conjecture. As wolves, foxes, and ravens had already torn the corpse to pieces, the doctor considered that he, too, might take his share, and therefore brought home with him from his excursion an object carefully wrapped up and concealed among the hunting equipment, namely, the Chukchi's head. It was immediately sunk to the sea-bottom, where it remained for a couple of weeks to be skeletonised by the crustacea swarming there, and it now has its number in the collections brought home by the *Vega*.

Our hunters now made hunting excursions in different directions, but the supply of game was scanty. The openings in the ice probably swarmed with seals, but they were too distant, and without a boat it was impossible to carry on any hunting there. Not a single Polar bear now appeared to be visible in the neighbourhood, although bears' skulls are found at several places on the beach, and this animal appears to play a great part in the imagination of the natives, to judge of the many figures of bears among the bone carvings I purchased from the Chukches. The natives often have a small strip of bear's skin on the seat of their sledges, but I have not seen any whole bear's skin here; perhaps the animal is being exterminated on the north coast of Siberia. Our wintering, therefore, will not enrich Arctic literature with any new bear stories—a very sensible difficulty for the writer himself. Wolves, on the other hand, occur on the *tundra* in sufficient abundance, even if one or other of the wolves found in mist and drifting snow, and saluted with shot, turned out, on a critical determination of species, to be our own dogs. At least, this was the case with the "wolf," that inveigled one of the crew into shooting a ball one dark night right through the thermometer case, fortunately without injuring the instruments, and with no other result than that he had afterwards to bear an endless number of jokes from his comrades on account of his wolf-hunt. Foxes, white, red, and black, also occurred here in great numbers, but they were at that season difficult to get at, and besides they had perhaps withdrawn from the coast

Hares, on the other hand, maintained themselves during the whole winter at Yinretlen, by day partly out on the ice partly on the cape, by night in the neighbourhood of the tents. Sweepings and offal from the proceeds of the chase had there produced a vegetation, which, though concealed by snow, yielded to the hares in winter a more abundant supply of food than the barren



CHUKCHI BONE-CARVINGS.

(The two largest figures represent bears)

tundra. It was remarkable that the hares were allowed to live between the tents and in their neighbourhood without being disturbed by the score of lean and hungry dogs belonging to the village. When farther into the winter for the sake of facilitating the hare-hunting I had a hut erected for Johnsen the hunter, he

chose as the place for it the immediate neighbourhood of the village, declaring that the richest hunting-ground in the whole neighbourhood was just there. The shooters stated that part of the hares became snow-blind in spring. The hares here are larger than with us, and have exceedingly delicious flesh.

On our arrival most of the birds had already left these regions, so inhospitable in winter, or were seen high up in the air in collected flocks, flying towards the south entrance of Behring's Straits. Still on the 19th October an endless procession of birds was seen drawing towards this region, but by the 3rd November it was noted, as something uncommon, that a gull settled on the refuse heaps in the neighbourhood of the vessel. It resembled the ivory gull, but had a black head. Perhaps it was the rare *Larus Sabinii*, of which a drawing has been given above.¹ All the birds which passed us came from the north-west, that is, from the north coast of Siberia, the New Siberian Islands or Wrangel Land. Only the mountain owl, a species of raven and the ptarmigan wintered in the region, the last named being occasionally snowed up.

The ptarmigan here is not indeed so plump and good as the Spitzbergen ptarmigan during winter, but in any case provided us with an always welcome, if scanty change from the tiresome preserved meat. When some ptarmigan were shot, they were therefore willingly saved up by the cook, along with the hares, for festivals. For in order to break the monotony on board an opportunity was seldom neglected that offered itself for holding festivities. Away there on the coast of the Chukchi peninsula there were thus celebrated with great conscientiousness during the winter of 1878-9, not only our own birthdays but also those of King Oscar, King Christian, and King Humbert, and of the Emperor Alexander. Every day a newspaper was distributed, for the day, indeed, but for a past year. In addition we numbered among our diversions constant intercourse with the natives, and frequent visits to the neighbouring villages, driving in dog-sledges, a sport which would have been very enjoyable if the dogs of the natives had not been so exceedingly poor and bad, and

¹ See p. 46.

finally industrious reading and zealous studies, for which I had provided the expedition with an extensive library, intended both for the scientific men and officers, and for the crew, numbering with the private stock of books nearly a thousand volumes.

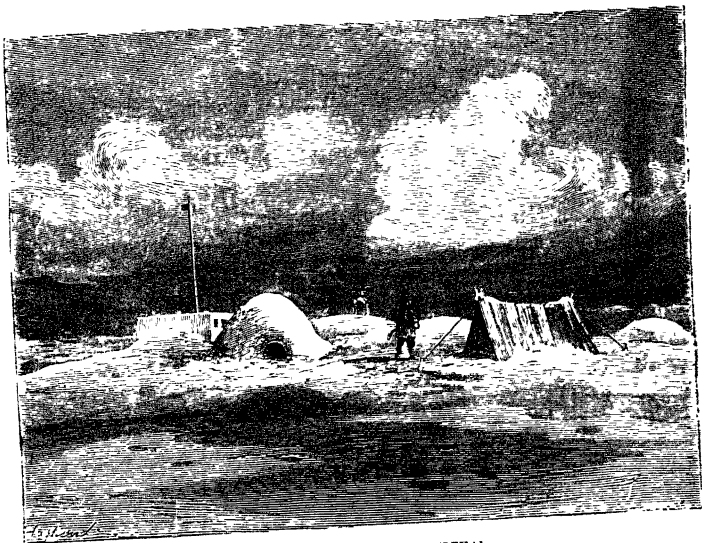
All this time of course the purely scientific work was not neglected. In the first rank among these stood the meteorological and magnetical observations, which from the 1st November were made on land every hour. However fast the ice lay around the vessel it was impossible to get on it a sufficiently stable base for the magnetical variation instrument. The magnetical observatory was therefore erected on land of the finest building material any architect has had at his disposal, namely, large parallelopipeds of beautiful blue-coloured ice-blocks. The building was therefore called by the Chukches *Tintinyaranga* (the ice-house), a name which was soon adopted by the *Vega* men too. The ice-house was a spacious observatory, well-fitted for its purpose in every respect. It had but one defect, the temperature was always at an uncomfortably low point.

Besides the nine scientific men and officers of the *Vega*, the engineer Nordström and the seaman Lundgren took part in the magnetical and meteorological observations. Every one had his watch of six hours, five of which were commonly passed in the ice-house. To walk from the vessel to the observatory, distant a mile, with the temperature under the freezing point of mercury, or, what was much worse, during storm, with the temperature at -36°C . remain in the observatory for five hours in a temperature of -17° , and then return to the vessel, commonly against the wind—for it came nearly always from the north or north-west—was dismal enough. None of us, however, suffered any harm from it. On the contrary, it struck me as if this compulsory interruption to our monotonous life on board and the long-continued stay in the open air had a refreshing influence both on body and soul.

In the neighbourhood of the ice-house the thermometer case was erected, and farther on in the winter there were built in the surrounding snow-drifts two other observatories, not however of ice, but of snow, in the Greenland snow-building style. Our

depôt of provisions was also placed in the neighbourhood, and at a sufficient distance from the magnetical observatory there was a large wooden chest, in which the Remington guns, which were carried for safety in excursions from the vessel, and other iron articles which the observer had with him, were placed before he entered the observatory.

When this ice-house was ready and hourly observations began



THE OBSERVATORY AT PITLEKAI
(After a Drawing by O. Nordquist)

in it, life on board took the stamp which it afterwards retained in the course of the winter. In order to give the reader an idea of our every-day life, I shall reproduce here the spirited sketch of a day on the *Vega*, which Dr. Kjellman gave in one of his home letters :—

“It is about half-past eight in the morning. He whose watch has expired has returned after five hours’ stay in the ice-house

where the temperature during the night has been about — 16° C. His account of the weather is good enough. There are only thirty-two degrees of cold, it is half-clear, and, to be out of the ordinary, there is no wind. Breakfast is over. Cigars, cigarettes, and pipes are lighted, and the gunroom *personnel* go up on deck for a little exercise and fresh air, for below it is confined and close. The eye rests on the desolate, still faintly-lighted landscape, which is exactly the same as it was yesterday; a white plain in all directions, across which a low, likewise white, chain of hillocks or *torosses* here and there raises itself, and over which some ravens with feeble wing-strokes, fly forward, searching for something to support life with. ‘Mechinko Orpist,’ ‘mechinko Okerpist,’ ‘mechinko Kellman,’ &c., now sounds everywhere on the vessel and from the ice in its neighbourhood. ‘Orpist’ represents Nordquist, ‘Okerpist’ again Stuxberg. It is the Chukches’ morning salutation to us. To-day the comparatively fine weather has drawn out a larger crowd than usual, thirty to forty human beings, from tender sucking babes to grey old folks, men as well as women; the latter in the word of salutation replacing the *tsch*-sound with an exceedingly soft caressing *ts*-sound. That most of them have come driving is shown by the equipages standing in the neighbourhood of the vessel. They consist of small, low, narrow, light sledges, drawn by four to ten or twelve dogs. The sledges are made of small pieces of wood and bits of reindeer-horn, held together by seal-skin straps. As runner-shoes thin plates of the ribs of the whale are used. The dogs, sharp-nosed, long-backed, and excessively dirty, have laid themselves to rest, curled together in the snow.

“The salutation is followed almost immediately to-day as on the preceding days by some other words: ‘Ouinga mouri kauka,’ which may be translated thus: ‘I am so hungry; I have no food; give me a little bread!’ They suffer hunger now, the poor beings. Seal flesh, their main food, they cannot with the best will procure for the time. The only food they can get consists of fish (two kinds of cod), but this is quite too poor diet for them, they have fallen off since we first met with them.

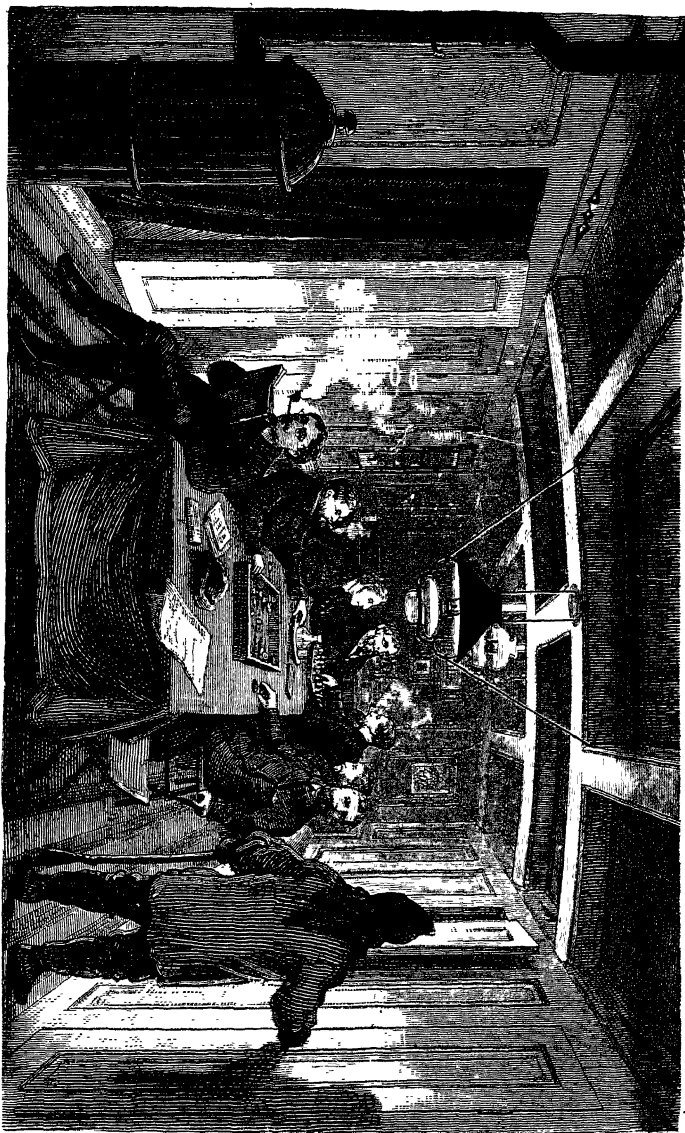
“Soon we are all surrounded by our Chukchi acquaintances. The daily market begins. They have various things to offer, which they know to be of value to us, as weapons, furs, ornaments, playthings, fish, bones of the whale, algæ, vegetables, &c. For all this only ‘kauka’ is now asked. To-day the supply of whales’ bones is large, in consequence of our desire, expressed

on previous days, to obtain them. One has come with two vertebræ, one with a rib or some fragments of it, one with a shoulder-blade. They are not shy in laying heavy loads on their dogs.

"After the close of the promenade and the traffic with the natives, the gunroom *personnel* have begun their labours. Some keep in their cabins, others in the gunroom itself. The magnetical and meteorological observations made the day before are transcribed and subjected to a preliminary working-out, the natural history collections are examined and looked over, studies and authorship are prosecuted. The work is now and then interrupted by conversation partly serious, partly jocular. From the engine-room in the neighbourhood we hear the blows of hammers and the rasping of files. In the 'tweendecks, pretty well heated, but not very well lighted, some of the crew are employed at ordinary ship's work; and in the region of the kitchen the cook is just in the midst of his preparations for dinner. He is in good humour as usual, but perhaps grumbles a little at the 'mosucks' (a common name on board for the Chukches), who will not give him any peace by their continual cries for 'mimil' (water).

"The forenoon passes in all quietness and stillness. Immediately after noon nearly all the gunroom people are again on deck, promenading backwards and forwards. It is now very lively. It is the crew's meal-time. The whole crowd of Chukches are collected at the descent to their apartment, the lower deck. One soup basin after the other comes up; they are immediately emptied of their contents by those who in the crowd and confusion are fortunate enough to get at them. Bread and pieces of meat and bits of sugar are distributed assiduously, and disappear with equal speed. Finally the cook himself appears with a large kettle, containing a very large quantity of meat soup, which the Chukches like starving animals throw themselves upon, baling into them with spoons, empty preserve tins, and above all with the hands. Notwithstanding the exceedingly severe cold a woman here and there has uncovered one arm and half her breast in order not to be embarrassed by the wide reindeer-skin sleeve in her attempts to get at the contents of the kettle. The spectacle is by no means a pleasant one.

"By three o'clock it begins to grow dark, and one after the other of our guests depart, to return, the most of them, in the morning. Now it is quiet and still. About six the crew have finished their labours and dispose of the rest of the day as they



AN EVENING IN THE GUNROOM OF THE "VEGA," DURING THE WINTERING.

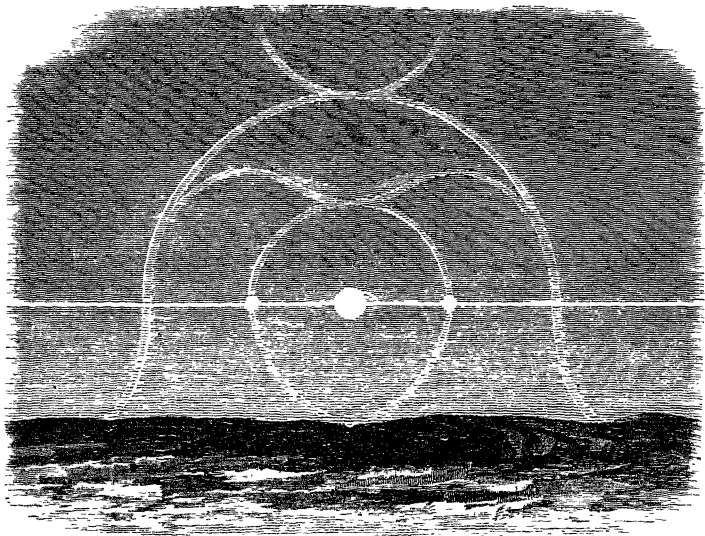
please. Most of them are occupied with reading during the evening hours. When supper has been served at half-past seven in the gunroom, he who has the watch in the ice-house from nine to two next morning prepares for the performance of his disagreeable duty; the rest of the gunroom *personnel* are assembled there, and pass the evening in conversation, play, light reading, &c. At ten every one retires, and the lamps are extinguished. In many cabins, however, lights burn till after midnight.

“Such was in general our life on the *Vega*. One day was very like another. When the storm howled, the snow drifted, and the cold became too severe, we kept more below deck; when the weather was finer we lived more in the open air, often paying visits to the observatory in the ice-house, and among the Chukches living in the neighbourhood, or wandering about to come upon, if possible, some game.”

The snow which fell during winter consisted more generally of small simple snow-crystals or ice-needles, than of the beautiful snow-flakes whose grand kaleidoscopic forms the inhabitants of the north so often have an opportunity of admiring. Already with a gentle wind and with a pretty clear atmosphere the lower strata of the atmosphere were full of these regular ice-needles, which refracted the rays of the sun, so as to produce parhelia and halos. Unfortunately, however, these were never so completely developed as the halos which I saw in 1873 during the sledge-journey round North-East Land on Spitzbergen; but I believed that even now I could confirm the correctness of the observation I then made, that the representation which is generally given of this beautiful phenomenon, in which the halo is delineated as a collection of regular circles, is not correct, but that it forms a very involved system of lines, extended over the whole vault of heaven, for the most part coloured on the sun-side and uncoloured on the opposite side, of the sort shown in the accompanying drawings taken from the account of the Spitzbergen Expedition of 1872-73.

Another very beautiful phenomenon, produced by the refraction of the solar rays by the ice-needles, which during winter were constantly mixed with the atmospheric strata lying nearest the

surface of the earth, was that the mountain heights to the south of the *Vega* in a certain light appeared as if feathered with fire-clouds. In clear sunshine and a high wind we frequently saw as it were, a glowing pillar of vapour arise obliquely from the summits of the mountains, giving them the appearance of volcanoes, which throw out enormous columns of smoke, flame-



REFRACTION-HALO

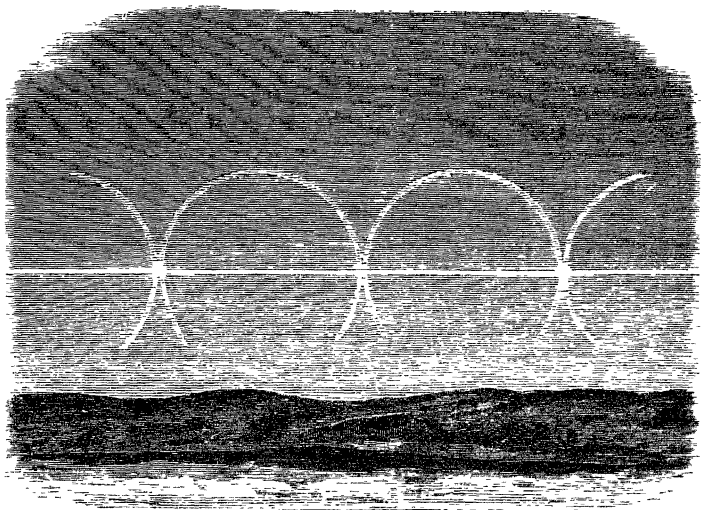
Seen on Spitzbergen in May, 1873, simultaneously with the Reflection-halo delineated on the following page.

coloured by the reflection from the glowing lava streams in the depths of the crater.

A blue water-sky was still visible out to sea, indicating that open water was to be found there. I therefore sent Johnsen the hunter over the ice on the 18th December to see how it was. In three-quarters of an hour's walking from the vessel he found an extensive opening recently covered with thin, blue, newly frozen

ice. A fresh northerly breeze blew at the time, and by it the drift-ice fields were forced together with such speed, that Johnsen supposed that in a couple of hours the whole lead would be completely closed.

In such openings in Greenland white whales and other small whales are often inclosed by hundreds, the natives thus having an opportunity of making in a few hours a catch which would be



REFLECTION HALO.

Seen simultaneously with the Refraction-halo delineated on the preceding page, in the part of the sky opposite the sun.

sufficient for their support during the whole winter, indeed for years, if the idea of *saving* ever entered into the imagination of the savage. But here in a region where the pursuit of the whale is more productive than in any other sea, no such occurrence has happened. During the whole of our stay on the coast of the Chuckchi country we did not see a single whale. On the other hand, masses of whales' bones were found thrown up on the

beach. At first I did not bestow much attention upon them, thinking they were the bones of whales that had been killed during the recent whale-fishing period. I soon found however that this could not have been the case. For the bones had evidently been washed out of the sandy dune running along the beach, which had been deposited at a time when the present coast lay ten to twenty metres below the surface of the sea, thus hundreds or thousands of years ago, undoubtedly before the time when the north coast of Asia was first inhabited by man. The whales' bones in question were thus *subfossil*. Their number was so great, that in the systematic examination of the beach in the immediate neighbourhood of the vessel, which I undertook during spring with the assistance of Dr. Kjellman and half a dozen of



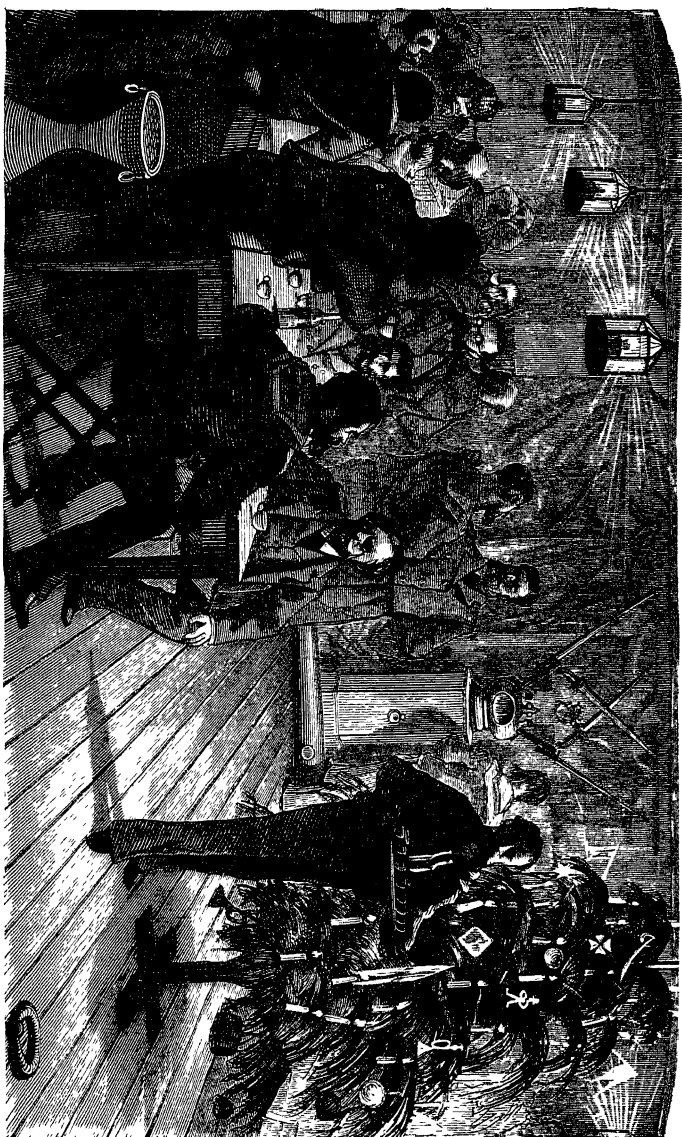
SECTION OF THE BEACH STRATA AT PITLIKAI

1. Hard frozen coarse sand 2. The sea 3. Beach of fine dry sand with masses of bones of the whale 4. Coast-lagoon

the sailors thirty neck-bones and innumerable other bones of the whale were found in a stretch of from two and a half to three miles. Of course masses of bones are still concealed in the sand; and a large number of lower jaw-bones, ribs, shoulder-blades, and vertebræ had been used for runner-shoes, tent-frames, spades, picks and other implements. A portion, after being exposed for several years to the action of the air, had undergone decay. The bones are therefore found in greatest number at those places where the sand of the dune has been recently carried away by the spring floods or by the furious winds which prevail here, and which easily gain the ascendancy over the dry sand, bound together only by widely scattered Elymus-stalks. The largest crania belonged to a species nearly allied to the *Balæna mysticetus*. Crania of a species of *Rachianectes* are also found along with

some bones of smaller varieties of the whale. No complete skeleton however has been found, but we brought home with us so large a quantity of the loose bones that the collection of whales' bones alone would have formed a full cargo for a small vessel. These bones will be delineated and described by Professor A. W. MALM in *The Scientific Work of the Vega Expedition*. Special attention was drawn to a skeleton, belonging to the *Balaena mysticetus*, by its being still partially covered with skin, and by deep red, almost fresh, flesh adhering to those parts of it which were frozen fast in the ground. This skeleton lay at a place where the dune sand had recently been washed away and the coarse underlying sand uncovered, the whale-mummy also I suppose coming to light at the same time. That the whale in question had not stranded in the memory of man the Chukches assured me unanimously. In such a case we have here a proof that even portions of the flesh of gigantic sea-animals have been protected against putrefaction in the frozen soil of Siberia—a parallel to the mammoth-mummies, though from a considerably more recent period.

Christmas Eve was celebrated in the usual northern fashion. We had indeed neglected, as in the Expedition of 1872-73, to take with us any Christmas tree. But instead of it Dr. Kjellman prevailed on our Chukchi friends to bring with dog-sledges willow-bushes from the valleys lying beyond the mountains to the south. By means of these a bare driftwood stem was converted into a luxuriant, branchy tree which, to replace the verdure, was clothed with variegated strips of paper, and planted in the 'tweendecks, which after our inclosure in the ice had been arranged as a working room, and was now set in order for the Christmas festivities, and richly and tastefully ornamented with flags. A large number of small wax-lights, which we had brought with us for the special purpose, were fixed in the Christmas tree, together with about two hundred Christmas boxes purchased or presented to us before our departure. At six o'clock in the afternoon all the officers and crew assembled in the 'tweendecks, and the drawing of lots began, now and then interrupted by a thundering polka round the peculiar Christmas tree. At supper neither Christmas



CHRISTMAS EVE ON THE "YFOA"

ale nor ham was wanting. And later in the evening there made their appearance in the 'tweendecks five punchbowls, which were emptied with songs and toasts for King and Fatherland, for the objects of the Expedition, for its officers and men, for the families at home, for relatives and friends, and finally for those who decked and arranged the Christmas tree, who were the sailors C. Lundgren and O. Hansson, and the firemen O. Ingelsson and C. Carlström.

The other festivals were also celebrated in the best way, and at midnight the New Year was welcomed with sharp explosive-shell firing from the rifled cannon of the *Vega*, and a number of rockets thrown up from the deck.

■

CHAPTER IX.

Hope of release at the new year—Bove's excursion to the open water—Mild weather and renewed severe cold—Mercury frozen—Popular lectures—Brusewitz's excursion to Naitskai—Another despatch of letters home—The natives' accounts of the state of the ice on the coast of Chukchi Land—The Chukches carry on traffic between Arctic America and Siberia—Excursions in the neighbourhood of winter quarters—The weather during spring—The melting of the snow—The aurora—The arrival of the migratory birds—The animal world of Chukchi Land—Noah Eliser's relief expedition—A remarkable fish—The country clear of snow—Release—The North-East Passage achieved.

THE new year came in with a faint hope of release. For since the north and north-west winds that had prevailed almost constantly towards the close of December had given place to winds from the east and south, considerable "clearings" were again formed out at sea. On New Year's Day, in order to see the state of the ice farther out to sea, Lieut. Bove, accompanied by the hunter Johnsen, again made an excursion to the open water, which was reached after four hours' steady walking. Even from the top of a sixteen feet high ice-rampart no boundary of the open water could be seen to the north-east or north. Partly from this, partly from the extension of the water-sky in this direction, Lieut. Bove drew the conclusion that the breadth of the open water was at least twenty-two miles. The water swarmed with seals, according to Johnsen, both bearded and rough. Neither Polar bears, walrusses, nor birds were seen.

Lieut. Bove's report confirmed me in my supposition that the open water, as towards the end of January 1873 at Mussel Bay, might possibly extend as far as our anchorage and open for us

the way to Behring's Straits, in which case we could not refrain from continuing our voyage, however unpleasant and dangerous it might be at this season of the year. But the *Vega's* ice-fetters remained undisturbed, and the blue border at the horizon grew less and again disappeared. This caused so great a want of food, and above all of train oil, among the natives, that all the inhabitants of Pitlekai, the village nearest to us, were compelled



THE OPEN WATER.

to remove to the eastward, notwithstanding that in order to mitigate the scarcity a considerable quantity of food was served out daily at the vessel.

On the 6th February a south-east wind began to blow, and the severe cold at once ceased. The temperature rose for a few hours to and even above the freezing-point. A water-sky was again formed along the horizon of the ice from north-east to north, and from the heights at the coast there was seen an extensive opening

in the ice-fields, which a little east of Irgunnuk nearly reached the shore. Even between the vessel's anchorage and the land various cracks had been formed, through which the sea water had forced its way under the snow, and in which some of us got cold foot or leg baths during our walks to and from the land.

The Chukches at Irgunnuk were now successful in killing a Polar bear and seventy seals, of which some were ostentatiously set up in rows, along with frozen slices of blubber, along the outer walls of the tents, and others were laid down in the blubber cellars, which were soon filled to overflowing. At Yinretlen, the encampment nearer us, the hunters on the other hand had obtained only eight seals. Still joy and improvidence prevailed here also, and our skin-clad friends exhibited a self-satisfied disdain of the simple provisions from the *Vega*, which the day before they had begged for with pitiful gestures, and on which they must, in a day or two, again depend. The children, who had fallen off during recent weeks, if not in comparison with European children, at least with well-fed Chukchi ones, began speedily to regain their former condition, as also did the older people. Begging ceased for some days, but the vessel's deck still formed a favourite rendezvous for crowds of men, women, and children. Many passed here the greater part of the day, cheerful and gay in a temperature of -40° C., gossiped, helped a little, but always only a little, at the work on board. The mild weather, the prospect of our getting free, and of an abundant fishing for the Chukches, however, soon ceased. The temperature again sank below the freezing-point of *mercury*, and the sea froze so far out from the shore that the Chukches could no longer carry on any fishing. Instead we saw them one morning come marching, like prisoners on an Egyptian or Assyrian monument, in single file over the ice toward the vessel, each with a burden on his shoulder, whose true nature, while they were at a distance, we endeavoured in vain to guess. These burdens turned out to be pieces of ice, not particularly large, which they, self-satisfied, cheerful and happy at their new hit,

handed over to the cook to get from him in return some of the *kauka* (food) they some days before had despised.

During the severe cold the ice naturally became thicker and thicker; and by the continual northerly winds still higher *torosses* were heaped up round the vessel, and larger and larger snow masses were collected between it and the land, and on the heights along the coast. All hopes or fears of an early release were again given up, and a perceptible dulness began to make itself felt after the bustle and festivities of the Christmas holidays. There was now arranged a series of popular lectures held on the lower deck, which treated of the history of the North-East Passage, the first circumnavigations of the globe, the Austrian-Hungarian Expedition, the changes of the earth's surface, the origin of man, the importance of leaves to plants, &c. This formed both for the officers and scientific men and the crew a little interruption to the monotony of the Arctic winter life, and the lecturer could always be certain of finding a full and highly interested auditory. Some slight attempts at musical evening entertainments were also made, but these failed for want of musical instruments and musical gifts among the *Vega* men. We had among us no suitable director of theatrical representations after the English-Arctic pattern, and even if we had had, I fear that the director would have found it very difficult to obtain the dramatic talent requisite for his entertainment.

On the 17th February Lieutenant Brusewitz made an excursion to Naitskai, of which he gives the following account:—

“I and Notti left the vessel in the afternoon, and after two hours came to Riraitinop, Notti's home; where we passed the night, together with his three younger brothers and an invalid sister, who all lived in the same tent-chamber. Immediately after our arrival one of the brothers began to get the dog-harness and sleigh ready for the following day's journey, while the rest of us went into the interior of the tent, where the invalid sister lay with her clothes off, but wrapt in reindeer skins. She took charge of two train-oil lamps, over which hung two cooking

vessels, one formerly a preserve tin, and the other a bucket of tinned iron. One of the brothers came in with a tray, on which was placed a piece of seal blubber, together with frozen vegetables, principally willow leaves. The blubber was cut into small square pieces about the size of the thumb, after which one of the brothers gave the sister a large portion both of the blubber and vegetables. The food was then served out to the others. Every piece of blubber was carefully imbedded in vegetables before it was eaten. When the vegetables were finished there was still some blubber,



NOTTI AND HIS WIFE AITANGA.
(After photographs by L. Palander)

which was given to the dogs that lay in the outer tent. After this the boiled spare-ribs of a seal were partaken of, and finally a sort of soup, probably made from seal's blood. The sister had a first and special helping of these dishes. I also got an offer of every dish, and it did not appear to cause any offence that I did not accept the offer. After the close of the meal the cooking vessels were set down, the "pesks" taken off, and some reindeer skins taken down from the roof and spread out. The elder brothers lighted their pipes, and the younger lay down to sleep. I was shown to one of the side places in the tent, evidently Notti's

own. One of the lamps was extinguished, after which all slept. During the night the girl complained several times, when one of the brothers always rose and attended to her. At six in the morning I awoke the party and reminded them of our journey. All rose immediately. We continued our journey along the shore, and at 10 o'clock a.m. arrived at Naitskai, which is from fifteen to eighteen kilometres E.S.E. from Irgunnuk. Here we were received by most of our former neighbours, the inhabitants of Pitlekai. At Naitskai I went out hunting accompanied by a Chukchi. We started eight hares, but did not succeed in getting within range of them. A red fox was seen at a great distance, but neither ptarmigan nor traces of them could be discovered. At two in the afternoon I returned to Irgunnuk and there got another sleigh drawn by ten dogs, with which I soon reached the vessel."

On the 20th February three large Chukchi sledges laden with goods and drawn by sixteen to twenty dogs stopped at the *Vega*. They said they came from the eastward, and were on their way to the market in the neighbourhood of Nishni Kolymsk. I again by way of experiment sent with them home-letters, for which, as they declined to take money, I gave them as postage three bottles of rum and abundant entertainment for men and dogs. In consideration of this payment they bound themselves faithfully to execute their commission and promised to return in May. And they kept their word. For on the 8th and 9th May a large number of sledges, heavily laden with reindeer skins and drawn by many dogs, passed along the coast from west to east. Of course all rested at the *Vega*, the only house of entertainment on the coast of the Asiatic Arctic Sea, considering it as a matter of indisputable right that they should in return for a little talk and gossip obtain food and "ram." Very eagerly they now informed us that a letter would come with another dog train that might be expected in a few hours. This was for us a very great piece of news, the importance of which none can understand who have never hungered for months for news from home. Eager to know if we had actually to expect *a post* from Europe, we asked them how large the packet was. "Very large" was the answer, and the "ram" was of course measured accordingly. But when at

last the letter came it was found to be only an exceedingly short note from some of the Russian officials at Kolyma, informing me that our letters had reached him on the 4th April = 23rd March, and had been immediately sent by express to Yakutsk. Thence they were sent on by post, reaching Irkutsk on the 26th = 14th May, and Sweden on the 2nd August.

During autumn and midwinter the sunshine was not of course strong and continuous enough to be painful to the eyes, but in February the light from the snow-clouds and the snow-drifts began to be troublesome enough. On the 22nd February accordingly snow-spectacles were distributed to all the men, an indispensable precaution, as I have before stated, in Arctic journeys. Many of the Chukches were also attacked with snow-blindness somewhat later in the season, and were very desirous of obtaining from us blue-coloured spectacles. Johnsen even stated that one of the hares he shot was evidently snow-blind.

In the beginning of March there passed us a large number of sledges laden with reindeer skins, and drawn by eight to ten dogs each. Every sledge had a driver, and as usual the women took no part in the journey. These trains were on a commercial journey from Irkaipi to Pak at Behring's Straits. We found among the foremen many of our acquaintances from the preceding autumn, and I need not say that this gave occasion to a special entertainment, for the people, bread, a little spirits, soup, some sugar, and tobacco, for the dogs, pemmican.

On the 13th March we came to know that spirits, too, form an article of commerce here. For, without having obtained any liquor from the *Vega*, the Chukches at Yinretlen had the means of indulging in a general fuddle, and that even their friendly disposition gives way under the effects of the intoxication we had a manifest proof, when the day after they came on board with blue and yellow eyes, not a little seedy and ashamed. In autumn a tall and stout Chukchi giantess, who then paid us a visit, informed us that her husband had been murdered in a drunken quarrel.

Sledges of considerable size, drawn by reindeer, began after the middle of March to pass the *Vega* in pretty large numbers.

They were laden with reindeer skins and goods bought at the Russian market-places, and intended for barter at Behring's Straits.

The reindeer Chukches are better clothed, and appear to be in better circumstances and more independent than the coast Chukches, or, as they ought to be called in correspondence with the former name, the dog Chukches. As every one owns a reindeer herd, all must follow the nomad mode of living, but at the same time they carry on traffic between the natives of the northernmost parts of America and the Russian fur-dealers in Siberia, and many pass their whole lives in commercial journeys. The principal market is held annually during the month of March, on an island in the river Little Anjui, 250 versts from Nishni Kolymsk. The barter goes on in accordance with a price-list, mutually agreed upon by the Russian merchants and the oldest of the Chukches. The market is inaugurated on the part of the Russians by a mass performed by the priest,¹ who always accompanies the Russian crown commissioner, and in the Chukches' camp with buffoonery by one of the Chukchi Shamans. At such a market there is said to be considerable confusion, to judge by the spirited description which Wrangel gives of it (*Reise*, i. p. 269). We ought, however, to remember that this description refers to the customs that prevailed sixty

¹ During the market the Russian priest endeavours to make proselytes; he succeeds, too, by distributing tobacco to induce one or two to subject themselves to the ceremony of baptism. No true conversion, however, can scarcely come in question on account of the difference of language. As an example of how this goes on, the following story of Wrangel's may be quoted. At the market a young Chukchi had been prevailed upon, by a gift of some pounds of tobacco, to allow himself to be baptised. The ceremony began in presence of a number of spectators. The new convert stood quiet and pretty decent in his place till he should step down into the baptismal font, a large wooden tub filled with ice-cold water. In this, according to the baptismal ritual, he ought to dip three times. But to this he would consent on no condition. He shook his head constantly, and brought forward a large number of reasons against it, which none understood. After long exhortations by the interpreter, in which promises of tobacco probably again played the principal part, he finally gave way and sprang courageously down into the ice-cold water, but immediately jumped up again trembling with cold, crying, "My tobacco! my tobacco!" All attempts to induce him to renew the bath were fruitless, the ceremony was incomplete, and the Chukchi only half baptised.

years ago. Now, perhaps, there is a great change there. In the commercial relations in north-eastern Asia in the beginning of this century, we have probably a faithful picture of the commerce of the Beormas in former days in north-eastern Europe. Even the goods were probably of the same sort at both places, perhaps, also, the stand-points of the culture of the two races.

Besides the traders, a large number of Chukches from Kolyuchin Island and other villages to the west, travelled past us with empty sledges, to which were harnessed only a few dogs. They returned in the course of a few days with their sledges fully laden with fish, which they said they had caught in a lagoon situated to the eastward. They also sometimes sold a delicious variety of the Coregonus taken in a lake in the interior some distance from the coast.

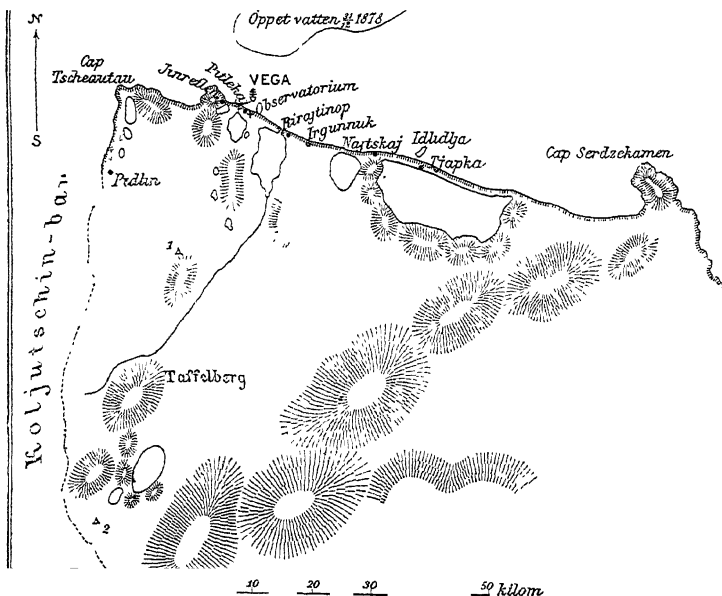
Further on in winter a number of excursions were undertaken in different directions, partly to find out these fishing places, partly to get an idea of the mode of life of the reindeer Chukches. Short as these excursions were, they give us, however, much information regarding our winter life, and our contact with the little-known tribe, on the coast of whose land the *Vega* had been beset, and on that account, perhaps, there may be reasons for making extracts from some of the reports given in to me with reference to these journeys.

Palander's and Kjellman's excursion to a reindeer Chukch camp south-west of Pitlekai, is sketched by the former thus :—

“On the 17th March, 1879, accompanied by Dr. Kjellman, I went out with a sledge and five men, among them a native as guide to the reindeer Chukchi camp in the neighbourhood of Table Mountain, with a view to obtain fresh reindeer flesh. The expedition was fitted out with two days' provisions, tent, mattresses, and *pesks*. The reindeer Chukches were met with eleven English miles from the vessel. On an eminence here were found two tents, of which one at the time was uninhabited. The other was occupied by the Chukchi, Rochitlen, his young wife, and another young pair.

“In the afternoon Kjellman and I were invited into the tent, where we passed an hour in their sleeping chamber. On our

entrance the lamp, which was filled with seal oil, was lighted; a sort of moss (sphagnum) was used as a wick. Our hostess endeavoured to make our stay in the tent as agreeable as possible; she rolled together reindeer skins for pillows and made ready for us a place where, stretched at full length, we might enjoy much needed repose. In the outer tent the other women prepared



MAP OF THE REGION ROUND THE "VEGA'S" WINTER QUARTERS.

Mainly after G. Bove.

1. Rochitlen's tent.

2. Yettugin's tent

supper, which consisted of boiled seal's-flesh. We received a friendly invitation to share their meal, but as we had no taste for seal's-flesh, we declined their offer under the pretext that we had just had dinner. They took their meal lying with the body in the inner tent, but with the head under the reindeer-skin curtain in the outer, where the food was. After the meal was partaken of, their heads were drawn within the curtain; our

host divested himself of all his clothes, the trousers excepted, which were allowed to remain. Our hostess let her *pesk* fall down from her shoulders, so that the whole upper part of the body thus became bare. The reindeer-skin boots were taken off, and turned outside in; they were hung up in the roof over the lamp to dry during the night. We treated the women to some sugar, which, in consequence of their want of acquaintance with it, they at first examined with a certain caution, finding afterwards that it tasted exceeding well. After the meal our host appeared to become sleepy; we accordingly said good-night, and went to our own tent, where it was quite otherwise than warm, the temperature during the night being about—11° C.

“After for the most part a sleepless night, we rose at half-past six next morning. When we came out of the tent we saw all the reindeer advancing in a compact troop. At the head was an old reindeer with large horns, that went forward to his master, (who had gone to meet the herd), and bade him good-morning by gently rubbing his nose against his master’s hands. While this was going on the other reindeer stood drawn up in well-ordered ranks, like the crew in divisions on board a man-of-war. The owner then went forward and saluted every reindeer; they were allowed to stroke his hands with their noses. He on his part took every reindeer by the horn and examined it in the most careful way. After the inspection was ended, at a sign given by the master the whole herd wheeled round and returned in closed ranks, with the old reindeer in front, to the previous day’s pasture.”

Of Brusewitz’s and Nordquist’s excursion to Nuchoityin, the latter gives the following account:—

“On the 20th March, at 9 o’clock a.m. Lieut. Brusewitz, boatswain Lustig, the Norwegian hunters Johnsen and Sievertsen, the Chukch Notti, and I, left the *Vega*. Our equipment, which consisted of provisions for eight days, cooking apparatus, canvas tent, india-rubber mattresses, reindeer-skin *pesks*, &c., we drew after us on a sledge. At 2.45 p.m. we came to Nuchoitjin (Coregonus Lake). During our journey we passed a river which flows between Nuchoitjin and the mountain Hochkeanranga about ten English miles south of this lake and falls into the great lagoon south of Pitlekai. Farther into the interior this river, according to Notti’s statement, flows through several lakes :

he also informed us that in summer it abounds very much in salmon (*lienne*). Some sandy hills formed the watershed between it and Nuchoitjin. The only animal we saw during our outward journey was a fox. On the other hand we found traces of hares, ptarmigan, and a couple of lemmings. After we had found a suitable camping-place, we began to build a snow-house, which, however, we could not get ready till next day. On the 21st Brusewitz and I went out to view our nearest surroundings. We employed the 22nd in cutting some holes in the ice, which was about one and a half metres thick, and in setting a net. Next morning we got in the net eleven Coregoni, of which the largest were about thirty-five centimetres long. As on the outward journey I went with Notti, he advised me to offer a little food and brandy to the Spirit of the Lake, *itjaken kamak*, in order to get good net fishing. On my inquiring what appearance he had, Notti replied '*uinga lilapen*,' 'I have never seen him.' Besides this spirit there are in his view others also in streams, in the earth, and in some mountains. The Chukches also sacrifice to the sun and moon. On the other hand they do not appear, as some other races, to pay any sort of worship to their departed friends. When I gave him a biscuit and bade him offer it, he made with the heel a little depression in the snow on Nuchoitjin, crumbled a little bit of the biscuit in pieces, and threw the crumbs into the hollow. The rest of the biscuit he gave back, declaring that *kamak* did not require more, and that we should now have more fish in the net than the first time. Notti said also that the Chukches are wont to sacrifice something for every catch. Thus have probably arisen all the collections of bear and seal skulls and reindeer horns, which we often saw on the Chukchi coast, especially on eminences.

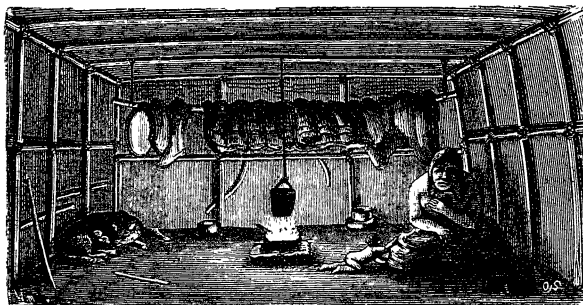
"On the 25th we came on board again. According to the aneroid observations made during the journey, the highest summit we visited had a height of 197 metres."

Lieutenant Bove made an excursion to Naitskai and Tiapka, of which the following is a brief account:—

"On the 19th April, at 4 o'clock a.m. the hunter Johnsen and I started on a short excursion eastward along the coast, with a view to pay a visit to the much frequented fishing station Naitskai, where our old friends from Pilekai had settled. We had a little sledge which we ourselves drew, and which was laden

with provisions for three days and some meteorological and hydrographical instruments.

"At six o'clock a.m. we reached Riraitinop, where we found Notti, a serviceable, talented, and agreeable youth. The village Riraitinop, which formerly consisted of a great many tents, now had only one tent, Notti's, and it was poor enough. The village Irgunnuk lies from three to four hundred metres from Riraitinop, and consists of five tents. At noon we reached Naitskai, where our arrival had been announced by a native, who, with his dog-team, had driven past us on the way. Accordingly on our entrance we were surrounded by the youth of the village, who deafened us with their unceasing cries for bread (*kauka*), tobacco,

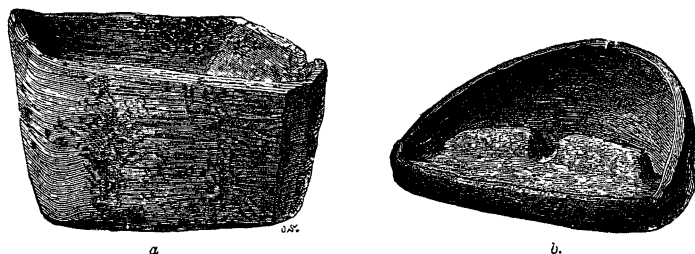


THE SLEEPING CHAMBER IN A CHUKCH TENT.
(After a drawing by the seaman Hansson)

ram, &c. After some moments the begging urchins were joined both by women and full-grown men. We entered a tent, which belonged to a friend or perhaps relation of Notti. There we were very well received. In the same tent a reindeer-Chukchi also lodged who had given us his company on the way. He went into the sleeping chamber, threw himself down there, took part in the family's evening meal, all almost without uttering a word to the hostess, and the next morning he started without having saluted the host. Hospitality is here of a peculiar kind. It may perhaps be expressed thus: *To-day I eat and sleep in your tent, to-morrow you eat and sleep in mine*; and accordingly, as far as I saw, all, both rich and poor, both those who travelled with

large sledges, and those who walked on foot, were received in the same way. All are sure to find a corner in the tent-chamber.

"The tent-chamber, or *yaranga*, as this part of the tent is called by the natives, takes up fully a third-part of the whole tent, and is at the same time work-room, dining-room, and sleeping chamber. Its form is that of a parallelopiped; and a moderately large sleeping chamber has a height of about six feet, a length of $11\frac{1}{2}$, and a breadth of seven feet. The walls are formed of reindeer skin with the hair inwards, which are supported by a framework of posts and cross-bars. The floor consists of a layer of grass undermost, on which a walrus skin is spread. The grass and the skin do not form a very soft bed, yet one on which even a tired European wanderer may find rest. The interior of the sleeping-chamber is lighted and warmed by lamps, whose number varies according to the size of the room.



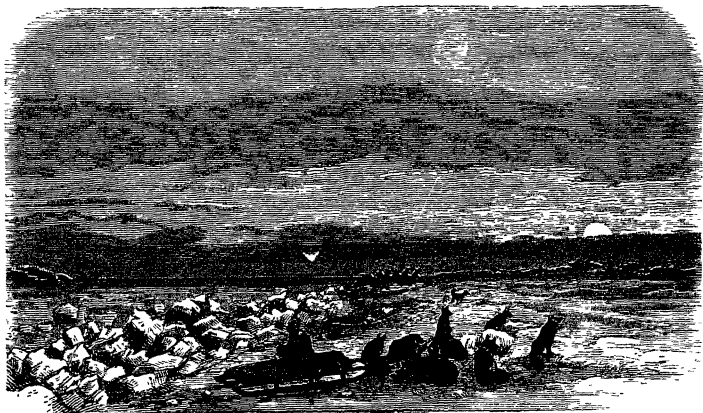
CHUKCHI LAMPS.

a. Of wood. b. Of stone.

One-fifth of the natural size.

A moderately large chamber has three lamps, the largest right opposite the entrance, the two others on the cross walls. The lamps are often made of a sort of stone, which is called by the natives *ukulshi*. They have the form of a large ladle. The fuel consists of train-oil, and moss is used for the wick. In the roof of the bed chamber some bars are fixed over the lamps on which clothes and shoes are hung to dry. The lamps are kept alight the whole day; during night they are commonly extinguished, as otherwise they would require continual attention. Some clothes and fishing implements, two or three reindeer skins to rest upon—these are the whole furniture of a Chukchi tent.

"Every tent is besides provided with some drums (*yárar*). These are made of a wooden ring, about seventy centimetres in diameter, on which is stretched a skin of seal or walrus gut. The drum is beaten with a light stick of whalebone. The sound thus produced is melancholy, and is so in a yet higher degree when it is accompanied by the natives' monotonous, commonly rhythmical songs, which appear to me to have a strong resemblance to those we hear in Japan and China. A still greater resemblance I thought I observed in the dances of



THE COAST BETWEEN PADLJONNA AND ENJURMI.

To the west Idlidlja Island, in the background the village Tjapka, to the right the great lagoon.

(After a drawing by O. Nordquist)

these peoples. Notti is a splendid *yárar*-player. After some pressing he played several of their songs with a feeling for which I had not given him credit. The auditors were numerous, and by their smiles and merry eyes one could see that they were transported by the sounds which Notti knew how to call from the drum. Notti was also listened to in deep silence, with an admiration like that with which in a large room we listen to a distinguished pianist. I saw in the tent no other musical instrument than that just mentioned.

"The day we arrived at Naitskai we employed in viewing the neighbourhood of the village. We accordingly ascended a hill about one hundred feet high to the south of the village in order to get a clear idea of the region. From the summit of the hill we had a view of the two lagoons west and east of Naitskai.

"The fishing in the eastern lagoon takes place mainly in the neighbourhood of Naitskai, at a distance of about three miles from the village. Hooks are exclusively used, and no nets or other fishing implements. In a few minutes I saw twenty cod (*wrokadlin*) caught, and about as many small fish, called by the natives *nukionukio*. For the fishing the natives make a hole in the ice, about four inches in diameter. Round the hole they build, as a protection against wind and drifting snow, a snow wall thirty-one inches high, forming a circle with an inner diameter of five feet. The fish-hooks are of iron and are not barbed. The line is about sixteen feet long, and is fixed to a rod nearly a yard in length. At the end of the angling line hangs a weight of bone, and beside it the hook. It is generally the women who fish, yet there are generally two or three men about to open the holes, build the walls, and keep the fishing-place clear.

"The day after our arrival at Naitskai we visited the village Tjapka, which lies at a distance of three miles and a half. This village contains thirteen tents, some of which are more roomy and better built than any Chukchi tent I have previously seen. We lodged in a tent which belonged to Erere, a friendly man with a face that was always cheerful. His sleeping-chamber was so large that it could hold more than one family. We found the inmates there completely naked, Erere's wife Kedlanga, not excepted.

"Erere's family was very numerous, according to the prevailing state of matters here. He had five children, whose names, according to their age, were, Hatanga, Etughi, Vedlat, Uai, and Umonga. In all the tents which I visited I have inquired the number of children. Only two or three wives had more than three; the average may be estimated at two.

"The children are from their tenderest years set apart for each other; thus Etughi, Erere's second son, who was little more than eight, was set apart for Keipteka, a girl of six or seven. Etughi and Keipteka slept under the same roof, though apart. 'When they grow bigger,' said Erere to me, 'their sleeping-places will be put alongside each other.' At what age this

takes place I have not ascertained, but I suppose that it is very early, as is common with all Oriental races.

"Regarding life in the tent I have the following notes: The most troublesome work is given to the older women. They rise early to light and attend to the lamps, yoke the dogs, and go fishing. The young women, on the other hand, sleep far into the day. The housewives return at noon; their work is then finished, if we do not consider as work the constant motion of the tongue in talk and gossip. The younger people have it assigned to them to sew clothes, arrange the fishing-lines and nets, prepare skins, &c. Sewing-thread is made from the back sinews of the reindeer, which they procure by barter from the reindeer-Chukches, giving for them fish and seal-blubber.

"One cannot, without having seen it, form any idea of the large quantity of food they can consume. One evening I saw eight persons, including one child, eat about 30 lbs. of food. The bill of fare was: 1, raw fish; 2, soup; 3, boiled fish; 4, seal-blubber; 5, seal-flesh. The raw fish commonly consists of frozen cod. The soup is made partly of vegetables, partly of seal-blood; I saw both kinds. Vegetable soup was prepared by boiling equal quantities of water and vegetables, till the mixture formed a thick pap. The blood soup is cooked by boiling the blood together with water, fish, and fat. They are very fond of this soup. The sea-blubber they eat by stuffing into the mouth the piece which has been served to them, and then cutting a suitable mouthful with the knife, which they bring close to the lips. In the same way they do with the flesh.

"With the exception of the old women's gossip the greatest quietness prevails in the sleeping-chamber. It is not uncommon for men to visit each other. Thus the first night we spent at Naitskai the tent where we lodged was full of people, but without the least disturbance arising. If one had anything to say he talked in quite a low tone, as if he were shy. He was listened to attentively, without any interruption. When he had finished another began.

"Affection between spouses and parents and children is particularly strong, I have seen fathers kiss and caress their children before they went to rest, and what I found most remarkable was that the children never abused this tender treatment. Whatever one gave them, it was their first thought to divide it with their parents. In this respect and in many others they were far in advance of a large number of European children."

In the society on board the prospects of an alteration in the constant north winds, the perpetual snow-storms and the unceasing cold, and the hope of a speedy release from the fetters of the ice, were naturally constantly recurring topics of conversation. During this time many lively word-battles were fought between the weather prophets in the gunroom, and many bets made in jest between the optimists and pessimists. The former won a great victory, when at noon on the 8th February the temperature rose to $+0^{\circ}1$ C., but with the exception of this success fortune always went against them. The north wind, the drifting snow and the cold, would never cease. A blue water-sky indeed was often visible at the horizon to the north and north-east, but the "clearing" first reached our vessel a couple of hours before we left our winter haven for ever, and up to the 15th June the thickness of the ice was almost undiminished (five feet). The sun rose higher and higher, but without forming any crust upon the snow, although upon the black hull of the *Vega*, perhaps with the help of the heat in the interior, it had by the 14th March melted so much snow that small icicles were formed at the gunwale. It was one of the many deceptive prognostications of spring which were hailed with delight. However, immediately after, severe cold recommenced and continued during the whole of the month of April, during which the temperature of the air never rose above $-4^{\circ}6$, the mean temperature being $-18^{\circ}9$.

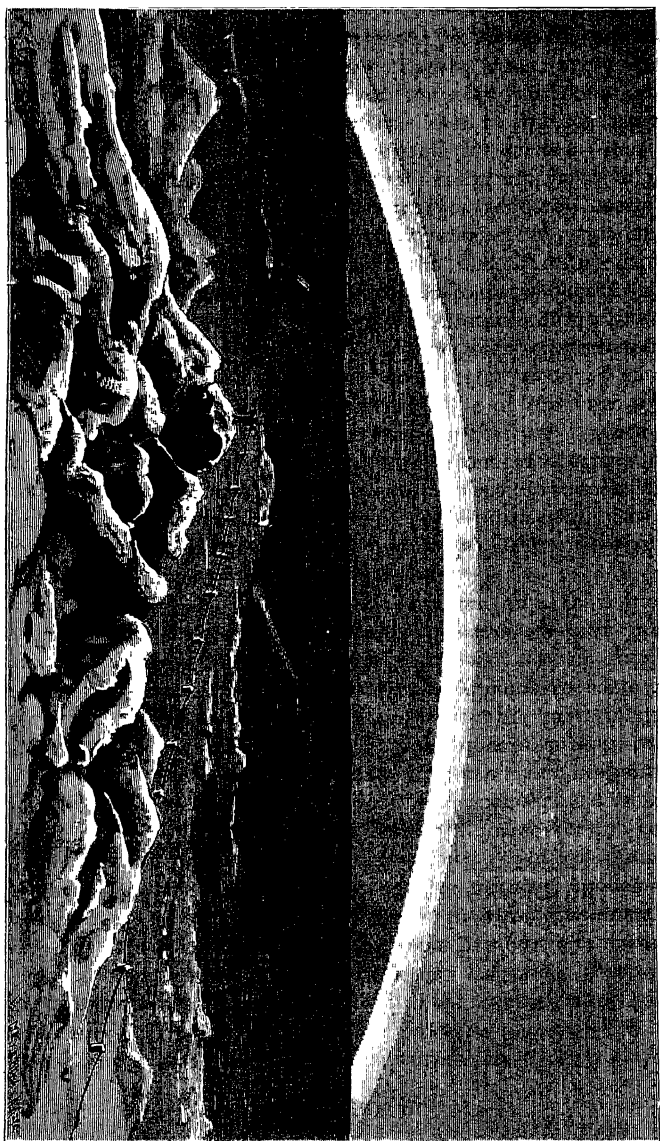
May began with a temperature of $-20^{\circ}1$. On the 3rd the thermometer showed $-26^{\circ}8$, and in the "flower month" we had only for a few hours mild weather with an air temperature $+1^{\circ}8$. Even the beginning of June was very cold; on the 3rd we had $-14^{\circ}3$, with a mean temperature for the twenty-four hours of $-9^{\circ}4$. Still on the 13th the thermometer at midnight showed $-8^{\circ}0$, but the same day at noon with a gentle southerly wind a sudden change took place, and after that date it was only exceptionally that the thermometer in the open air sank below the freezing-point. The melting and evaporation of snow now began, and went on so rapidly that the land in the end of the month was almost free of snow.

The aurora is, as is well known, a phenomenon at the same time cosmic and terrestrial, which on the one hand is confined within the atmosphere of our globe and stands in close connection with terrestrial magnetism, and on the other side is dependent on certain changes in the sun, the nature of which is as yet little known, and which are indicated by the formation of spots ; the distinguished Dutch physicist, VON BAUMHAUER, has even connected the aurora with cosmic substances which fall in the form of dust from the interstellar spaces to the surface of the earth. This splendid natural phenomenon besides plays, though unjustifiably, a great part in imaginative sketches of winter life in the high north. It is in the popular idea so connected with the ice and snow of Polar lands, that most readers of Arctic travel would certainly consider it an indefensible omission if the author did not give an account of the aurora as seen from his winter station. The man of science indeed knows that this omission is, in most cases, occasioned by the great infrequency of the strongly luminous aurora in the Franklin archipelago on the north coast of America, where most of the Arctic winterings of this century have taken place. Still scarcely any journey of exploration has been undertaken to the uninhabited regions of the high north, which has not in its working plan included the collection of data towards clearing up the true nature of the aurora and its position in the heavens. But the scientific results have seldom corresponded to the expectations which had been entertained. Of purely Arctic expeditions, so far as I know, only two, the Austro-Hungarian to Franz Josef Land (1872-4) and the Swedish to Mussel Bay (1872-73), have returned with full and instructive lists of auroras.¹ ROSS, PARRY, KANE, MCCLINTOCK, HAYES, NARES, and others, have on the other hand only had opportunities of registering single auroras ; the phenomenon in the case of their

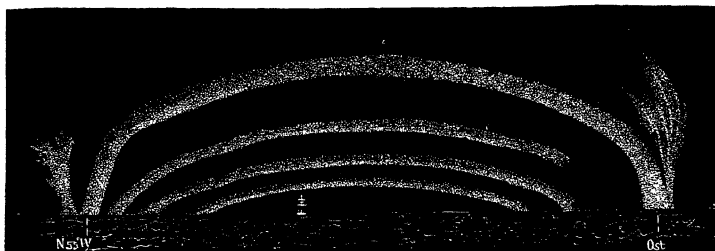
¹ I do not include *La Recherche's* wintering in 1838-39 at Bosekop, in the northernmost part of Norway, as it took place in a region which is all the year round inhabited by hundreds of Europeans. During this expedition very splendid auroras were seen, and the studies of them by LOTTIN, BRAVAIS, LILLIEHÖÖK, and SILJESTROM, are among the most important contributions to a knowledge of the aurora we possess, while we have to thank the draughtsmen of the expedition for exceedingly faithful and masterly representations of the phenomenon.

winterings has not formed any distinctive trait of the Arctic winter night. It was the less to be expected that the *Vega* expedition would form an exception in this respect, as its voyage happened during one of the years which we knew beforehand would be a minimum aurora year. It was just this circumstance, however, which permitted me to study, in a region admirably suited for the purpose, a portion of this natural phenomenon under uncommonly favourable circumstances. For the luminous arcs, which even in Scandinavia generally form starting-points for the radiant auroras, have here exhibited themselves undimmed by the more splendid manifestations. I have thus, undisturbed by subsidiary phenomena, been able to devote myself to the collection of data for ascertaining the position of these luminous arcs, and I believe that I have in this way come to some very remarkable conclusions, which have been developed in detail in a separate paper printed in *The Scientific Work of the Vega Expedition* (Part I. p. 400). Here space permits me only to make the following statement:—

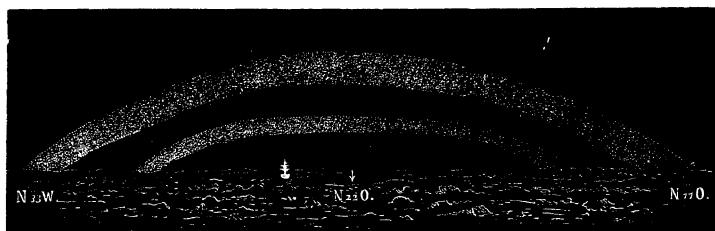
The appearance of the aurora at Behring's Straits in 1878-79 is shown in the accompanying woodcuts. We never saw here the magnificent bands or draperies of rays which we are so accustomed to in Scandinavia, but only halo-like luminous arcs, which hour after hour, day after day, were unaltered in position. When the sky was not clouded over and the faint light of the aurora was not dimmed by the rays of the sun or the full moon, these arcs commonly began to show themselves between eight and nine o'clock p.m., and were then seen without interruption during mid-winter till six, and farther on in the year to three o'clock in the morning. It follows from this that the aurora even during a minimum year is a permanent natural phenomenon. The nearly unalterable position of the arcs has further rendered possible a number of measurements of its height, extent, and position from which I believe I may draw the following inferences:—that our globe even during a minimum aurora year is adorned with an almost constant, single, double, or multiple luminous crown, whose inner edge is situated at a height of about 120 miles or 0·03 radius of the earth above its surface, whose centre, "the aurora-



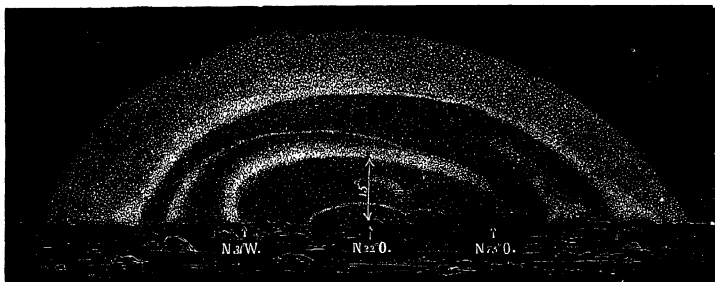
THE COMMON AURORA-BOREALIS AT THE "VEGA'S" WINTER QUARTERS.



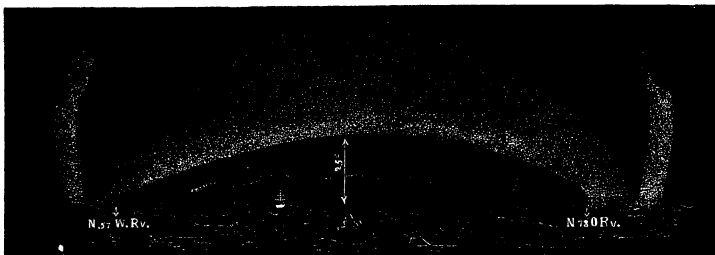
AURORA AT THE "VEGA'S" WINTER QUARTERS, 3RD MARCH, 1879, AT 9 P.M.



DOUBLE AURORA-ARCS SEEN 20TH MARCH, 1879, AT 9 30 P.M.



ELLIPTIC AURORA SEEN 21ST MARCH, 1879, AT 2 15 A.M.



ELLIPTIC AURORA SEEN 21ST MARCH, 1879, AT 3 A.M.

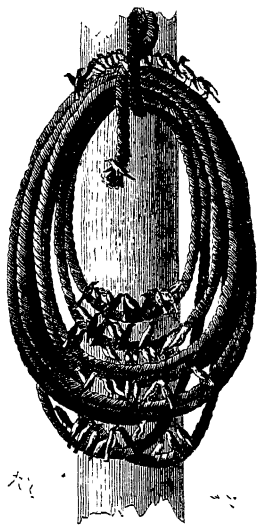
pole," lies somewhat under the earth's surface, a little north of the magnetic pole, and which, with a diameter of 1,200 miles, or 0.3 radius of the earth, extends in a plane perpendicular to the radius of the earth, which touches the centre of the circle.

I have named this luminous crown *the aurora glory* on account of its form and its resemblance to the crown of rays round the head of a saint. It stands in the same relation to the ray and drapery auroras of Scandinavia as the trade and monsoon winds in the south to the irregular winds and storms of the north. The light of the crown itself is never distributed into rays, but resembles the light which passes through obscured glass. When the aurora is stronger, the extent of the light-crown is altered: double or multiple arcs are seen, generally lying in about the same plane and with a common centre, and rays are cast between the different arcs. Arcs are seldom seen which lie irregularly to or cross each other.

The area in which the common arc is visible is bounded by two circles drawn upon the earth's surface, with the aurora-pole for a centre and radii of 8° and 28° measured on the circumference of the globe. It touches only to a limited extent countries inhabited by races of European origin (the northernmost part of Scandinavia, Iceland, Danish Greenland), and even in the middle of this area there is a belt passing over middle Greenland, South Spitzbergen, and Franz Josef Land, where *the common arc* forms only a faint, very widely extended, luminous veil in the zenith, which perhaps is only perceptible by the winter darkness being there considerably diminished. This belt divides the regions where these luminous arcs are seen principally to the south from those in which they mainly appear on the northern horizon. In the area next the aurora-pole only the smaller, in middle Scandinavia only the larger, more irregularly formed luminous crowns are seen. But in the latter region, as in southern British America, aurora storms and ray and drapery auroras are instead common, and these appear to lie nearer the surface of the earth than the arc aurora. Most of the Polar expeditions have wintered so near the aurora-pole that *the common aurora arc* there lay under or quite near the horizon, and as the ray aurora appears to occur seldom

within this circle, the reason is evident why the winter night was so seldom illuminated by the aurora at the winter quarters of these expeditions, and why the description of this phenomenon plays so small a part in their sketches of travel.

Long before the ground became bare of snow and mild weather commenced migratory birds began to arrive : first the snow-bunting on the 23rd April, then large flocks of geese, eiders, long-tailed ducks, gulls, and several kinds of waders, and song-birds. First among the latter was the little elegant *Sylvia Ewersmanni*, which in the middle of June settled in great flocks on the only dark spot which was yet to be seen in the region—the black deck of the *Vega*. All were evidently much exhausted, and the first thing the poor creatures did was to look out convenient sleeping-places, of which there is abundance in the rigging of a vessel so far as small birds are concerned. I need scarcely add that our new guests, the forerunners of spring, were disturbed on board as little as possible.



SONG-BIRDS IN THE RIGGING OF THE "VEGA"
June, 1879.

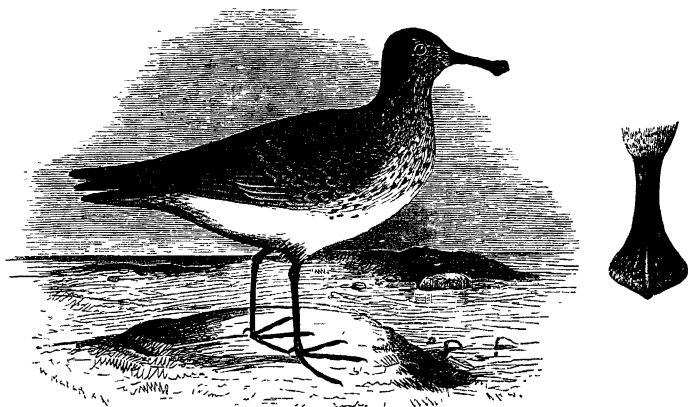
We now began industriously to collect material for a knowledge of the birds and mammals of the region. The collections, when this is being written, are not yet worked out, and I can therefore only make the following statement on this point :

From what I knew both directly and indirectly of the bird-world of the high north, I had drawn the erroneous conclusion that nearly the same species of birds are to be met with everywhere in the Polar lands of Europe, Asia, and America. Experience

gained during the expedition of the *Vega* shows that this is by no means the case, but that the north-eastern promontory of Asia, the Chukchi peninsula, forms in this respect a complete exception. Birds occur here in much fewer numbers, but with a very much greater variety of types than on Novaya Zemlya, Spitzbergen, and Greenland; in consequence of which the bird-world on the Chukchi peninsula has in its entirety a character differing wholly from that of the Atlantic Polar lands. We indeed meet here with types closely allied to the glaucous gull (*Larus glaucus*, Brünn.), the ivory gull (*L. eburneus*, Gmel.), the kittiwake (*L. tridactylus*, L.), the long-tailed duck (*Harelda glacialis*, L.), the king-duck (*Somateria spectabilis*, L.),¹ the phalarope (*Phalaropus fulicarius*, Bonap.), the purple sandpiper (*Tringa maritima*, Brünn.), &c., of Spitzbergen and Novaya Zemlya. But along with these are found here many peculiar species, for instance the American eider (*Somateria V-nigrum*, Gray), a swanlike goose, wholly white with black wing-points (*Anser hyperboreus*, Pall.), a greyish-brown goose with bushy yellowish-white feather-covering on the head (*Anser pictus*, Pall.), a species of Fuligula, elegantly coloured on the head in velvet-black, white, and green, (*Fuligula Stelleri*, Pall.), the beautifully marked, scarce *Larus Rossii*, Richards, of which Dr. Almquist on the 1st July, 1879, shot a specimen from the vessel, a little brown sandpiper with a spoonlike widened bill-point (*Eurynorhynchus pygmaeus*, L.), and various song-birds not found in Sweden, &c. Besides, a number of the Scandinavian types living here also, according to Lieutenant Nordquist, are distinguished by less considerable differences in colour-marking and size. The singular spoon-billed sandpiper was at one time in spring so common that it was twice served at the gunroom table, for which after our return home we had to endure severe reproaches from collectors. This bird is found only in some few museums. It was first described by LINNÆUS in *Museum Adolphi Friderici, Tomi secundi prodromus*, Holmiæ 1764 and then by C. P. THUNBERG in the *Transactions of the Swedish Academy of Sciences* for 1816 (p. 194),

¹ The common eider (*S. mollissima*, L.) is absent here, or at least exceedingly rare.

where it is stated that the homeland of this bird is tropical America. It has since been caught a few times in south-eastern Asia. Probably, like *Sylvia Eversmanni*, it passes the winter in the Philippine group of islands, but in summer visits the high north. Like several other birds which appeared in spring with the first bare spots it disappeared in July. Perhaps it retired to the interior to breed in the bush, or, which is more probable,



SPoon-BILLED SANDPIPER FROM CHUKCHI LAND.

Eurynorhynchus pygmaeus, L.

At the side the bird's bill seen from above, of the natural size.

went farther north to the islands or continents not yet discovered by Europeans.

The higher animal forms which, along with the Arctic explorer, dare to brave the cold and darkness of the Arctic night, exert on him a peculiar attraction. Regarding these, Lieutenant Nordquist has given me the following notes :—

“ The mammal most common in winter on the north coast of the Chukchi peninsula is the *hare*. It is generally met with in flocks of five or six on the hills in the neighbourhood of the tents,

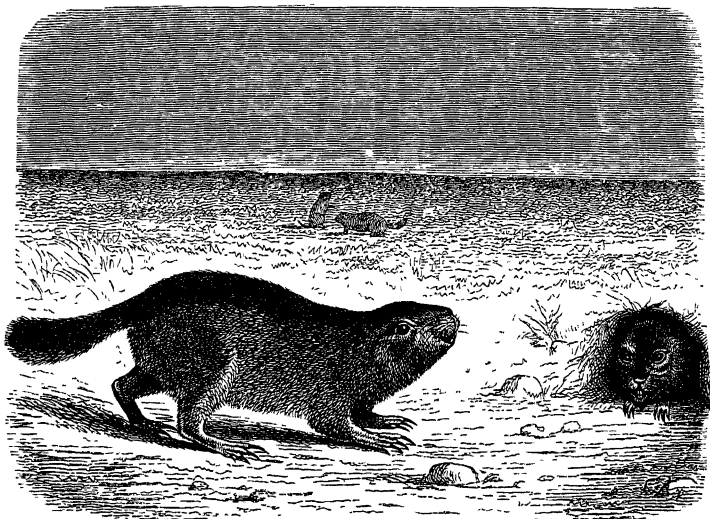
which are covered only with a thin layer of snow, notwithstanding the large number of hungry dogs which wander about. The *Arctic foxes* (*Vulpes lagopus*, L.) are very numerous. The common fox (*Vulpes vulgaris*, Gray) appears also to be common. A red fox, which Lieutenant Brusewitz shot from the vessel in October, differed considerably from the common fox, and approached the mountain fox. Of the *lemming* I have seen three varieties, viz. *Myodes obensis*, *M. torquatus*, and *Arvicola obscurus*. There is found here, also, according to the statements of the Chukches, a little mouse, in all probability a *Sorex*.

"The more uncommon land mammals wintering in these regions are the *wolf* and the *wild reindeer*. Footprints of the latter were seen on the 23rd March, in the mountain region fifteen to twenty miles south of Yinretlen. According to the Chukches' account some few reindeer remain on the hills along the coast, while the greater number migrate southwards towards winter. Besides these, two other mammals live here during winter, though they are only seen during summer and autumn, because they hibernate the rest of the time. These are the *land bear* and the *marmot* (*Arctomys* sp.). We saw no land bear, but on the 8th October Lieutenant Hovgaard and I found traces of this animal two or three English miles from the coast. The Chukches say that the land bear is not uncommon in summer. The marmot occurs in large numbers. Besides the animals enumerated above the natives talked of another, which is called by them *nennet*, and is said to live by the banks of rivers. According to their description it appears to be common *otter*. As at most places where the lemming is common the *weasel* (*Mustela vulgaris*, Briss.) is also found here. I got from the Chukches two skins of this animal. Whether the beaver occurs in the part of Chukchi Land which we visited I cannot say with certainty. It is probable, because the Chukches informed me that there was found here a weasel which has the point of the tail black.

"Only two sea mammals have been seen in this region in the course of the winter, viz. the *rough* or *bristled seal* and the *Polar bear*. Of land birds there winter in the region only three species, viz. an *owl* (*Strix nyctea*, L.), a *raven* (*Corvus* sp.), and a *ptarmigan* (*Lagopus subalpina*, Nilss.) ; the last-named is the most common. At open places in the sea there are found here in winter, the Chukches say, two swimming birds, the *loom* (*Uria Brünnichii*, Sabine) and the *black guillemot* (*Uria grylle*, L.)."

After the arrival of the migratory birds hunting excursions began to form a welcome interruption in our monotonous winter life, and the produce of the hunting a no less agreeable change from the preserved provisions.

On the 19th June a large number of Chukches travelling past us as usual came on board, partly to receive the tribute of hospitality to which they considered themselves entitled, partly to satisfy an easily understood curiosity and gossip a little about the



MARMOTS FROM CHUKCHI LAND.

most important occurrences of the preceding day. One of them, a middle-aged man, whom we had not seen before, with a friendly and self-satisfied bearing, whose face was a mere collection of wrinkles, and over whose *pesk* was drawn an old velvet shirt, presented himself with a certain pretentiousness as the chief NOAH ELISEI. Since the mistake with the stately Chepurin, and since even Menka's supposed slave declared himself to be at least as

good as Menka, we had begun to be rather indifferent to the rank of chief among the Chukches. Noah Elisei however, notwithstanding he thus brought forward his pretensions, was received like a common man, at which he appeared to be a little offended. But our behaviour soon changed, when Notti, or some other of our daily guests, who had become quite familiar with our fancies, tastes and weaknesses, informed us that Noah Elisei had with him a large, a very large letter. Old Noah thus carried a mail, perhaps a European mail. At once he became in our eyes a man of importance. After being stormed for a time with questions, he took from a bag which hung from his neck the ordinary pieces of board fastened together, which here serve as a postbag. They were found however to contain only a letter of a couple of lines from a Russian official at Nishni Kolymsk, without any news from Europe, but informing us that chief Noah Elisei was sent to us to assist us, if necessary. Noah first patted his stomach to indicate that he was hungry and wanted food, and hawked and pointed with his finger at his throat to let us know that a *ram* would taste well. He then told us something which we did not then exactly understand, but which we now have reason to interpret as a statement that Noah was the leader of an expedition sent by the Siberian authorities to our relief, and that he was therefore willing in return for suitable compensation to give us some reindeer. I availed myself of the offer, and purchased three animals for sugar, tea, and a little tobacco. Noah besides was a friendly and easy-going man, who, Christian though he was, travelled about with two wives and a large number of children, who all of course would see the vessel and get their treat of tobacco, clay pipes, sugar, *ram*, &c.

So much flood water had now begun to collect on the ice, especially near the land, that it was exceedingly difficult to walk from the vessel to the shore and back. Many a proposed land excursion was broken off by somebody, immediately after leaving the vessel, sinking into some deep hole in the ice and thus getting a cold bath. Excursions on land however began to be exceedingly interesting to the botanists and zoologists; and therefore to avoid the inconveniences mentioned I caused a tent to be pitched by the

side of the large lagoon between Pitlekai and Yinretlen, and a light boat to be carried thither. The bottom of the lagoon was still filled with ice, above which however the water stood so high that the boat floated in it. The naturalists settled by turns in the tent, and from it made excursions in different directions, as I hope with the result that the neighbourhood of Pitlekai is now the best known tract on the north of Asia, which after all is not



NOAH ELISELI.

(After a photograph by L. Palander.)

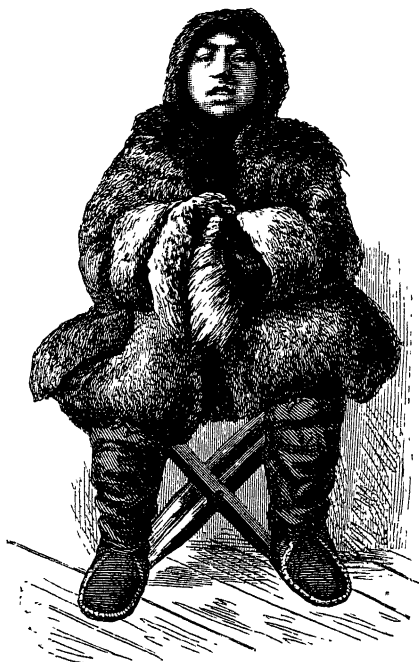
saying much. The first plant in flower (*Cochlearia fenestrata*, R. Br.) was seen on the 23rd June. A week after the ground began to grow green and flowers of different kinds showed themselves in greater and greater numbers. Some flies were seen on a sunny day in May (the 27th) in motion on the surface of the snow, but it was not until the end of June that insects began to show themselves in any large numbers, among them many Harpalids,

two large species of *Carabus*, and a large *Curculionid*. The insects occurring here however are not very numerous either in respect of species or individuals, which is not strange when we consider that the earth at a limited depth from the surface is constantly frozen. As even the shallow layer, which thaws in summer, is hard frozen in winter, all the insects which occur here must in one or other phase of their development endure being frozen solid for some time. But it may be reasonably asked with reference to this, that if life in an organism may so to speak be suspended for months by freezing stiff without being destroyed, what is there to prevent this suspension being extended over years, decades, or centuries?

The common idea, that all animal life ceases, when the interior animal heat sinks under the freezing-point of water, is besides not quite correct. This is proved by the abundant invertebrate life which is found at the bottom of the Polar Sea, even where the water all the year round has a temperature of -2° to $-2^{\circ}7$ C., and by the remarkable observation made during the wintering at Mussel Bay in 1872-73, that small crustacea can live by millions in water-drenched snow at a temperature of from -2° to $-10^{\circ}2$ C.

After the Chukches had told us that an exceedingly delicious black fish was to be found in the fresh-water lagoon at Yinretlen, which is wholly shut off from the sea and in winter freezes to the bottom, we made an excursion thither on the 8th July. Our friends at the encampment were immediately ready to help us, especially the women, Aitanga, and the twelve-year-old, somewhat spoiled *Vega*-favourite Reitinacka. They ran hither and thither like light-hearted and playful children, to put the net in order and procure all that was needed for the fishing. The catch was abundant. We caught by hundreds a sort of fish altogether new to us, of a type which we should rather have expected to find in the marshes of the Equatorial regions than up here in the north. The fish were transported in a dog sledge to the vessel, where some of them were placed in spirits for the zoologists and the rest fried, not without a protest from our old cook, who thought that the black slimy fish looked remarkably nasty and ugly. But the

Chukches were right: it was a veritable delicacy, in taste somewhat resembling eel, but finer and more fleshy. These fish were besides as tough to kill as eels, for after lying an hour and a half in the air they swam, if replaced in the water, about as fast as before. How this species of fish passes the winter is still more enigmatical than the winter life of the insects. For the lagoon



REITINACKA.

(After a photograph by L. Palander)

has no outlet and appears to freeze completely to the bottom. The mass of water which was found in autumn in the lagoon therefore still lay there as an unmelted layer of ice not yet broken up, which was covered with a stratum of flood water several feet deep, by which the neighbouring grassy plains were

inundated. It was in this flood water that the fishing took place.

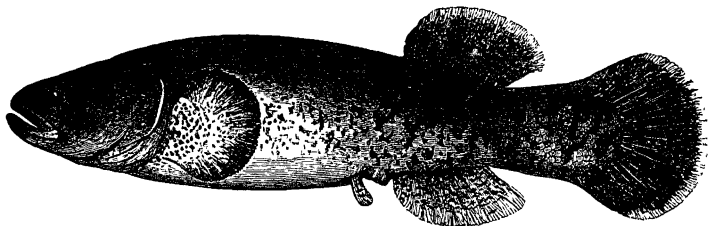
After our return home the Yinretlen fish was examined by Professor F. A. SMITT in Stockholm, who stated, in a paper which he read on it before the Swedish Academy of Sciences, that it belongs to a new species to which Professor Smitt gave the name *Dallia delicatissima*. A closely allied form occurs in Alaska, and has been named *Dallia pectoralis*, Bean. These fishes are besides nearly allied to the dog-fish (*Umbra Krameri*, Fitzing), which is found in the Neusiedler and Platten Lakes, and in grottos and other water-filled subterranean cavities in southern Europe. It is remarkable that the European species are considered uneatable, and even regarded with such loathing that the fishermen throw them away as soon as caught because they consider them poisonous. They also consider it an insult to be asked for dog-fish.¹ If we had known this we should not now have been able to certify that *Dallia delicatissima*, SMITT, truly deserves its name.

In the beginning of July the ground became free of snow, and we could now form an idea of how the region in which we had passed the winter looked in summer. It was not exactly attractive. Far away in the south the land rose with terrace-formed escarpments to a hill, called by us Table Mount, which indeed was pretty high, but showed none of those steep bold cliffs which generally form so picturesque a feature in the landscapes of those portions of Spitzbergen, Greenland, and the north part of Novaya Zemlya that I have visited. If I except the rocky promontory at Yinretlen, where a cliff inhabited by ravens rises boldly out of the sea, and some cliffs situated farther in along the beach of Kolyuchin Bay, the shore in the immediate neighbourhood of our wintering station consisted everywhere only of a low beach formed of coarse sand. Upon this sand, which was always frozen, there ran parallel with the shore a broad bank or dune, 160 to 320 feet broad, of fine sand, not water-drenched in summer, and accordingly not bound together by ice in winter. It is upon this dune that the Chukches erect their

¹ Heckel and Kner, *Die Süßwasserfische Oesterreichs*, p. 295.

tents. Marks of them are therefore met with nearly everywhere, and the dune accordingly is strewn with broken implements or refuse from the chase. Indeed it may be said without exaggeration that the whole north-eastern coast of the Siberian Polar Sea is bordered with a belt of refuse of various kinds.

The coarse sand which underlies the dune is, as has been stated, continually frozen, excepting the shallow layer which is thawed in summer. It is here that the "frost formation" of Siberia begins, that is to say, the continually frozen layer of earth, which, with certain interruptions, extends from the Polar



DOG-FISH FROM THE CHUKCHI PENINSULA.

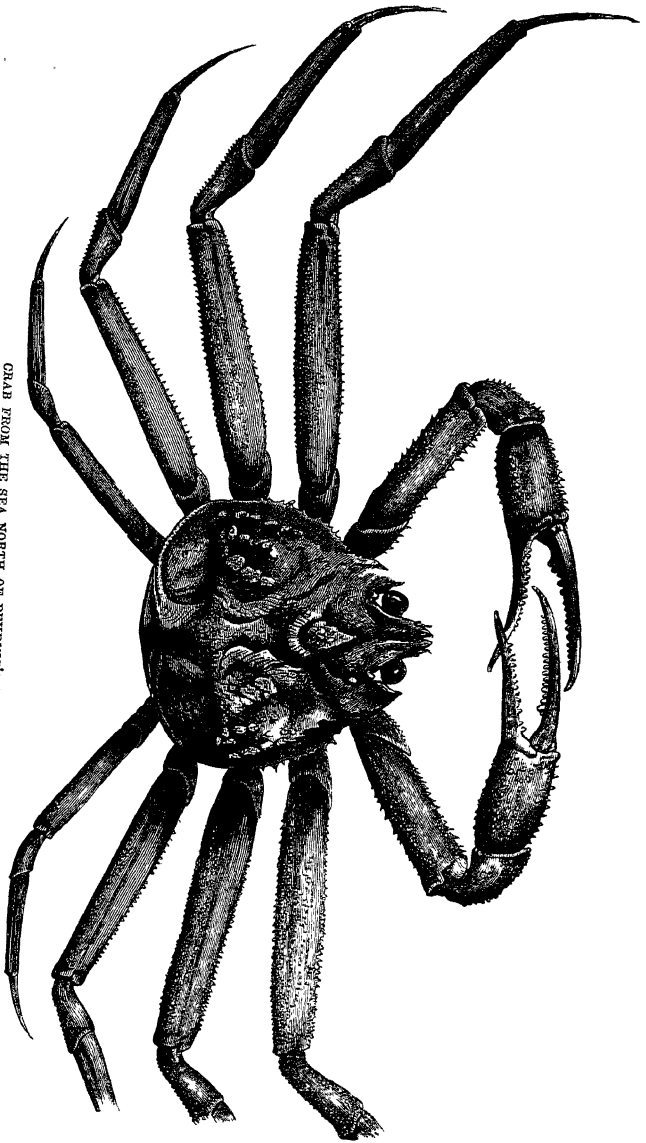
Dallia delicatissima, Smitt.

Half the natural size

Sea far to the south, not only under the treeless *tundra*, but also under splendid forests and cultivated corn-fields.¹ To speak correctly, however, the frozen earth begins a little from the shore *under the sea*.² For on the coast the bottom often consists of hard frozen sand—"rock-hard sand," as the dredgers were accustomed to report. The frost formation in Siberia thus embraces not only terrestrial but also marine deposits, together with pure clear layers of ice; the latter are formed in the mouths of rivers or in small lakes and reaching to the bottom, being in

¹ Even pretty far south, in Scandinavia, there occur places with frozen earth which seldom thaws.

² Middendorff states that the bottom of the sea of Okotsk is frozen. (*Sibirische Reise*, Bd. 4, 1, p 502.)



CRAB FROM THE SEA NORTH OF BEHRING'S STRAITS
Chionoecetes opilio, Kröyer.
Half the natural size.

spring covered with a layer of mud sufficiently thick to protect the ice from melting during summer. The frozen sea-bottom again appears to have been formed by the sand washed down by the rivers having carried with it when it sank some adhering water from the warm and almost fresh surface strata. At the sea-bottom the sand surrounded by *fresh* water freezing at 0° C. thus met a stratum of *salt* water whose temperature was two or three degrees under 0° , in consequence of which the grains of sand froze fast together.

From the shore a plain commences, which is studded with extensive lagoons and a large number of small lakes. In spring this plain is so saturated with water and so intersected by deep rapid snow-rivulets, that it is difficult, often impossible, to traverse it. Immediately after the disappearance of the snow a large number of birds had settled there. The Lapp sparrow had chosen a tuft projecting from the marshy ground on which to place its beautiful roofed dwelling, the waders in the neighbourhood had laid their eggs in most cases directly on the water-drenched moss without trace of a nest, and on tufts completely surrounded by the spring floods we met with the eggs of the loom, the long-tailed duck, the eider and the goose. Even during our stay, the water ran away so rapidly, that places, which one day were covered with a watery mirror, over which a boat of light draught could be rowed, were changed the next day to wet marshy ground, covered with yellow grass from the preceding year. At many places the grassy sward had been torn up by the ice and carried away, leaving openings sharply defined by right lines in the meadows, resembling a newly worked off place in a peat moss.

In summer there must be found here green meadows covered with pretty tall grass, but at the time of our departure vegetation had not attained any great development, and the flowers that could be discovered were few. I presume, however, that a beautiful Arctic flower-world springs up here, although, in consequence of the exposure of the coast-country to the north winds, poor in comparison with the vegetation in sheltered valleys in the interior of the country. There are found there too

pretty high bushes, but on the other hand trees are represented at Pitlekai only by a low species of willow which creeps along the ground.

We did not, however, see even this "wood" in full leaf. For in order that full summer heat may begin it is necessary, even here, that the ice break up, and this longed-for moment appeared to be yet far distant. The ice indeed became clear of snow in the beginning of July, and thus the slush and the flood water were diminished, which during the preceding weeks had collected on its surface and made it very difficult to walk from the vessel to land.

On the 17th the "year's ice" next the land at last broke up, so that an extensive land clearing arose. But the ground-ice was still undisturbed, and between this the "year's ice" lay so fast, that all agreed that at least fourteen days must pass before there was any prospect of getting free.

When on the 16th the reindeer-Chukchi Yettugin came on board, and, talking of the collection of whalebones in which we had been engaged some days before, informed us that there was a mammoth bone at his tent, and that a mammoth tusk stuck out at a place where the spring floods had cut into the bank of a river which flows from Table Mount to Riraitinop, I did not hesitate to undertake an excursion to the place. Our absence from the vessel was reckoned at five or six days. It was my intention to go up the river in a skin boat belonging to Notti to the place where the mammoth tusk was, and thence to proceed on foot to Yettugin's tent. Yettugin assured us that the river was sufficiently deep for the flat-bottomed boat. But when we had travelled a little way into the country it appeared that the river had fallen considerably during the day that Yettugin passed on the vessel. So certain was I, however, that the ice-barrier would not yet for a long time be broken up, that I immediately after my return from the excursion, which had thus been rendered unsuccessful, made arrangements for a new journey in order with other means of transport to reach the goal.

While we were thus employed the forenoon of the 18th passed. We sat down to dinner at the usual time, without any

suspicion that the time of our release was at hand. During dinner it was suddenly observed that the vessel was moving slightly. Palander rushed on deck, saw that the ice was in motion, ordered the boiler fires to be lighted, the engine having long ago been put in order in expectation of this moment, and in two hours, by 3.30 p.m. on the 18th July, the *Vega*, decked with flags, was under steam and sail again on the way to her destination.

We now found that a quite ice-free "lead" had arisen between the vessel and the open water next the shore, the ice-fields west of our ground-ice having at the same time drifted farther out to sea, so that the clearing along the shore had widened enough to give the *Vega* a sufficient depth of water. The course was shaped at first for the N.W. in order to make a *détour* round the drift-ice fields lying nearest us, then along the coast for Behring's Straits. On the height at Yinretlen there stood as we passed, the men, women, and children of the village all assembled, looking out to sea at the fire-horse—the Chukches would perhaps say fire-dog or fire-reindeer—which carried their friends of the long winter months for ever away from their cold, bleak shores. Whether they shed tears, as they often said they would, we could not see from the distance which now parted us from them. But it may readily have happened that the easily moved disposition of the savage led them to do this. Certain it is that in many of us the sadness of separation mingled with the feelings of tempestuous joy which now rushed through the breast of every man on board the *Vega*.

The ship met with no more ice-obstacles on her course to the Pacific. Serze Kamen was passed at 1.30 a.m. of the 19th, but the fog was so dense that we could not clearly distinguish the contours of the land. Above the bank of mist at the horizon we could only see that this cape, so famous in the history of the navigation of the Siberian Polar Sea, is occupied by high mountains, split up, like those east of the Bear Islands, into ruin-like gigantic walls or columns. The sea was bright as a mirror and nearly clear of ice; a walrus or two stuck up his head strangely magnified by the fog in our neighbourhood, seals

swam round us in large numbers, and flocks of birds, which probably breed on the steep cliffs of Serze Kamen, swarmed round the vessel. The trawl net repeatedly brought up from the sea-bottom a very abundant yield of worms, molluscs, crustacea, &c. A zoologist would here have had a rich field.

The fog continued, so that on the other side of Serze Kamen we lost all sight of land, until on the morning of the 20th dark heights again began to peep out. These were the mountain summits of the easternmost promontory of Asia, East Cape, an unsuitable name, for which I have substituted on the map that of Cape Deshnev after the gallant Cossack who, 230 years ago, circumnavigated it for the first time.

By 11 a.m. we were in the middle of the sound which unites the Northern Arctic Ocean with the Pacific, and at this point the *Vega* greeted the old and new worlds by a display of flags and the firing of a Swedish salute.

Thus finally was reached the goal towards which so many nations had struggled, since the time when Sir Hugh Willoughby, with the firing of salutes and with cheers from the festive-clad seamen, in the presence of an innumerable crowd of jubilant men certain of success, ushered in the long series of North-East voyages. But, as I have before related, their hopes were sadly disappointed. Innumerable other marine expeditions have since then trodden the same path, always without success, and generally with the sacrifice of the vessel and of the life and health of many brave seamen. Now for the first time, after the lapse of 336 years, and when most men experienced in navigation had declared the undertaking impossible, was the North-East Passage at last achieved. This has taken place, thanks to the discipline, zeal, and ability of our man-of-war's-men and their officers, without the sacrifice of a single human life, without sickness, without the slightest damage to the vessel, and under circumstances which show that the same thing may be done again in most, perhaps in all years, in the course of a few weeks. It may be permitted us to say, that under such circumstances it was with pride we saw the blue-yellow flag rise to the mast-head, and heard the Swedish salute in the sound where the old and

the new worlds stretch out hands to each other. The course along which we sailed is indeed no longer required as a commercial route between Europe and China. But it has been granted to this and the preceding Swedish expeditions to open a sea to navigation, and to confer on half a continent the possibility of communicating by water with the great oceans of the world.

CHAPTER X.

The history, physical characteristics, disposition, and manners of the Chukches.

THE north coast of Siberia is now, with the exception of its westernmost and easternmost parts, literally a desert. In the west there projects between the mouth of the Ob and the southern portion of the Kara Sea the peninsula of Yalmal, which by its remote position, its grassy plains, and rivers abounding in fish, appears to form the earthly paradise of the Samoyed of the present day. Some hundred families belonging to this race wander about here with their numerous reindeer herds. During winter they withdraw to the interior of the country or southwards, and the coast is said then to be uninhabited. This is the case both summer and winter, not only with Beli Ostrov and the farthest portion of the peninsula between the Ob and the Yenisei (Mattesol), but also with the long stretch of coast between the mouth of the Yenisei and Cháun Bay. During the voyage of the *Vega* in 1878 we did not see a single native. No trace of man could be discovered at the places where we landed, and though for a long time we sailed quite near land, we saw from the sea only a single house on the shore, a wooden hut on the east side of Chelyuskin peninsula. Russian *simovies* and native encampments are indeed still found on the rivers some distance from their mouths, but the former coast population has withdrawn to the interior of the country or died out,¹ and the north coast of Asia

¹ The north coast of America still forms the haunt of a not inconsiderable Eskimo population which, for a couple of centuries, has extended to the 80th

first begins again to be inhabited at Chaun Bay, namely, by the tribe with whom we came in contact during the latter part of the coast voyage of the *Vega* in 1878 and during the wintering.

I have already given an account of various traits of the Chukches' disposition and mode of life, but I believe that a more exhaustive statement of our experiences in this region will be interesting to my readers, even if in the course of it I am sometimes compelled to return to subjects of which I have already treated.

In West-European writings the race which inhabits the northeasternmost portion of Asia, is mentioned for the first time, so far as I know, by WITSEN, who in the second edition of his work (1705, p. 671) quotes a statement by VOLODOMIR ATLASOV, that the inhabitants of the northernmost portions of Siberia are called *Tsjuktsi*, without, however, giving any detailed description of the people themselves.

degree of latitude. As the climate in the north part of the Old World differs little from that which prevails in corresponding regions of the New, as at both places there is an abundant supply of fish, and as the seal and walrus hunting—at least between the Yenisei and the Chatanga—ought to be as productive as on the north coast of America, this difference which has arisen only recently, is very striking. It appears to me to be capable of explanation in the following way. Down to our days a large number of small savage tribes in America have carried on war with each other, the weaker, to escape extermination by the more powerful races, being compelled to flee to ice deserts of the north, deeming themselves fortunate if they could there, in peace from their enemies, earn a living by adopting the mode of life of the Polar races, suitable as it is to the climate and resources of the land. The case was once the same in Siberia, and there are many indications that fragments of conquered tribes have been in former times driven up from the south, not only to the north coast of the mainland, but also beyond it to the islands lying off it. In Siberia, however, for the last 250 years, the case has been completely changed by the Russian conquest of the country. The pressure of the new government has, notwithstanding many single acts of violence, been on the whole less destructive to the original population than the influence which the Europeans have exerted in America. The Russian power has at least had a beneficial influence, in so far as it has prevented the continual feuds between the native races. The tribes driven to the inhospitable north have been enabled to return to milder regions, and where this has not taken place they have, in the absence of new migrations from the South, succumbed in the fight with cold, hunger, and small-pox, or other diseases introduced by their new masters.

The Russians, however, had made a much earlier acquaintance with the Chukches; for during their conquest of Siberia they came in contact with this race before the middle of the seventeenth century. A company of hunters in 1646 sailed down the Kolyma river to the Polar Sea. East of the Kolyma they fell in with the Chukches, with whom they dealt in this way:—they laid down their goods on the beach and then retired, on which the Chukches came thither, took the goods, and laid furs, walrus tusks, or carvings in walrus ivory, in their place.

During these journeys the Russians often came in contact with the tribe which inhabited the north-eastern part of Asia, a contact which in general was not of a friendly nature. The bold hunters who contributed powerfully to the conquest of Siberia, and who even at their own hand entered into conflicts with whole armies from the Celestial Empire, appear not to have behaved well when confronted with the warriors of the Chukchi race. Even the attempts that were made with professional soldiers to conquer the land of the Chukches were without result, less however, perhaps, on account of the armed opposition which the Chukches made than from the nature of the country and the impossibility of even a small body of troops supporting themselves. In their numerous conflicts with the Russians the Chukches showed themselves brave and warlike, and on more than one occasion put their invaders to flight; even when defeated they refused to submit.

The old repute of the Chukches as a brave and savage race remained undiminished. Thus we read in a note already quoted at page 110 of the *Historie généalogique des Tartares*:¹ “The north-eastern part of Asia is inhabited by two allied races, *Tzuktzchi* and *Tzchalatzki*, and south of them on the Eastern Ocean by a third, called *Olutorski*. They are the most savage tribe in the whole north of Asia, and will have nothing to do

¹ The work is a translation made at Tobolsk by Swedish officers, prisoners of war from the battle of Pultava, from a Tartar manuscript by Abulgasi Bayadur Chan. The original manuscript (?) is in the library at Upsala, to which it was presented in 1722 by Lieutenant-Colonel Schönström. The translation has notes by Bentinck, a Dutchman by birth, who was also taken prisoner in the Swedish service at Pultava.

with the Russians, whom they inhumanly kill when they fall in with them, and when any of them fall into the hands of the Russians they kill themselves." On the map of LOTTERUS (1765) the Chukchi Peninsula is coloured in a way differing from Russian Siberia; and there is the following inscription: *Tjuktzchi natio ferocissima et bellicosa Russorum inimica, qui capti se invicem interficiunt*. In 1777 GEORGIUS says in his *Beschreibung aller Nationen des Russischen Reichs* (part ii., p. 350) of the Chukches: "They are more savage, coarse, proud, refractory, thievish, false, and revengeful, than the neighbouring nomads the Koryaks. They are as bad and dangerous as the Tunguses are friendly. Twenty Chukches will beat fifty Koryaks. The *Ostrogs* (fortified places) lying in the neighbourhood of their country are even in continual fear of them, and cost so much that the Government has recently withdrawn the oldest Russian settlement in those regions, Anadyrsk." Other statements to the same effect might be quoted, and even in our day the Chukches are, with or without justification, known in Siberia for stubbornness, courage, and love of freedom.

But what violence could not effect has been completely accomplished in a peaceful way.¹ The Chukches indeed do not pay any other taxes than some small market tolls, but a very active traffic is now carried on between them and the Russians, and many travellers have without inconvenience traversed their country, or have sailed along its pretty thickly inhabited coast.

The Chukches are sometimes confounded with the Koryaks, who are as nearly allied to the Chukches as the Spaniards to the Portuguese, but yet differ considerably in their mode of life; and also by some authors with the Eskimo. It appears indeed that recently, after the former national enmity had ceased, mixed races

¹ Lütke says (Erman's *Archiv*, iii. p. 464) that the peaceful relations with the Chukches began after the conclusion of a peace which was brought about ten years after the abandonment of Anadyrsk, where for thirty-six years there had been a garrison of 600 men, costing over a million roubles. This peace this formerly so quarrelsome people has kept conscientiously down to our days with the exception of some market brawls, which induced Treskin, Governor-General of Eastern Siberia, to conclude with them, in 1817, a commercial treaty which appears to have been faithfully adhered to, to the satisfaction and advantage of both parties (*Dittmar*, p. 128).

have arisen among these tribes. But it ought not to be forgotten that they differ widely in origin, although the Chukches as coming at a later date to the coast of the Polar Sea have adopted almost completely the hunting implements and household furniture of the Eskimo; and the Eskimo again, in the districts where they come in contact with the Chukches, have adopted various terms from their language.

Like the Lapps and most other European and Asiatic Polar races, the Chukches fall into two divisions speaking the same language and belonging to the same race, but differing considerably in their mode of life. One division consists of reindeer nomads, who, with their often very numerous reindeer herds, wander about between Behring's Straits, and the Indigirka and the Penshina Bays. They live by tending reindeer and by trade, and consider themselves the chief part of the Chukchi tribe. The other division of the race are the coast Chukches, who do not own any reindeer, but live in fixed but easily movable and frequently moved tents along the coast between Chaun Bay and Behring's Straits. But beyond East Cape there is found along the coast of Behring's Sea another tribe, nearly allied to the Eskimo. This is Wrangel's *Onkilon*, Lütke's *Namollo*. Now, however, Chukches also have settled at several points on this line of coast, and a portion of the Eskimo have adopted the language of the superior Chukchi race. Thus the inhabitants at St. Lawrence Bay spoke Chukchi, with little mixture of foreign words, and differed in their mode of life, and appearance only inconsiderably from the Chukches, whom during the course of the winter we learned to know from nearly all parts of the Chukchi peninsula. The same was the case with the natives who came on board the *Vega* while we sailed past East Cape, and with the two families we visited in Konyam Bay. But the natives in the north-west part of St. Lawrence Island talked an Eskimo dialect, quite different from Chukchi. There were, however, many Chukchi words incorporated with it. At Port Clarence on the contrary there lived pure Eskimo. Among them we found a Chukchi woman, who informed us that there were Chukchi villages also on the American side of

Behring's Straits, north of Prince of Wales Cape. These cannot, however, be very numerous or populous, as they are not mentioned in the accounts of the various English expeditions to those regions; they are not noticed for instance in Dr. JOHN SIMPSON'S instructive memoir on the Eskimo at Behring's Straits.

We were unable during the voyage of the *Vega* to obtain any data for estimating the number of the reindeer-Chukches. But the number of the coast Chukches may be arrived at in the following way. Lieutenant Nordquist collected from the numerous foremen who rested at the *Vega* information as to the names of the encampments which are to be found at present on the coast between Chaun Bay and Behring's Straits, and the number of tents at each village. He thus ascertained that the number of the tents in the coast villages amounts to about 400. The number of inhabitants in every tent may be, according to our experience, averaged at five. The population on the line of coast in question may thus amount to about 2,000, at most to 2,500, men, women, and children. The number of the reindeer-Chukches appears to be about the same. The whole population of Chukchi Land may thus now amount to 4,000 or 5,000 persons. The Cossack Popov reckoned in 1711 that all the Chukches, both reindeer-owning and those with fixed dwellings, numbered 2,000 persons. Thus during the last two centuries, if these estimates are correct, this Polar race has doubled its numbers.

There appear to be no dialects differing very much from each other. Whether foreign words borrowed from other Asiatic languages have been adopted in Chukchi we have not been able to make out. It is certain that no Russian words are used. The language strikes me as articulate and euphonious. It is nearly allied to the Koryak, but so different from other, both East-Asiatic and American, tongues, that philologists have not yet succeeded in clearing up the relationship of the Chukches to other races.

Like most other Arctic tribes, the Chukches now do not belong to any unmixed race. This one is soon convinced of, if he considers attentively the inhabitants of a large tent-village.



TYPICAL CHUKCH FACES.

1. Manschetsko, a man from Pitlekni. 2. Young man from Irgunnuk. 3. Chajdodlin, a man from Irgunnuk. 4. Reindeer-Chukch. 5. Old man from Irgunnuk. 6. Man from Yiuertlin.

(After photographs by L. Palander)



FAC

1, 2. Nautsing, a woman from Pitlekai 3, 4. Rotschitlen. 5 Young man from Vankarema.
6. Young man from Irgunnuk. (After photographs by L. Falander)

Some are tall, with tallowlike, raven-black hair, brown complexion, high aquiline nose—in short, with an exterior that reminds us of the descriptions we read of the North American Indians. Others again by their dark hair, slight beard, sunk nose or rather projecting cheek-bones and oblique eyes, remind us distinctly of the Mongolian race; and finally we meet among them with very fair faces, with features and complexion which lead us to suspect that they are descendants of runaways or prisoners of war of purely Russian origin. The most common type is—straight, coarse, black hair of moderate length; the brow tapering upwards; the nose finely formed, but with its root often flattened: eyes by no means small; well-developed black eyebrows; projecting cheeks often swollen by frostbite, which is specially observable when the face is looked at from the side; light, slightly brown complexion, which in the young women is often nearly as red and white as in Europeans. The beard is always scanty. Nearly all are stout and well grown; we saw no cripples among them. The young women often strike one as very pretty if we can rid ourselves of the unpleasant impression of the dirt, which is never washed away but by the drifting snow of winter, and of the nauseous train-oil odour which in winter they carry with them from the close tent-chamber. The children nearly always make a pleasant impression by their healthy appearance, and their friendly and becoming behaviour.

The Chukches are a hardy race, but exceedingly indolent when want of food does not force them to exertion. The men during their hunting excursions pass whole days in a cold of -30° to -40° C. out upon the ice, without protection and without carrying with them food or fuel. In such cases they slake their thirst with snow, and assuage their hunger, if they have been successful in hunting, with the blood and flesh of the animals they have killed. Often during severe cold women nearly naked leave for a while the inner tent, or tent-chamber, where the train-oil lamp maintains a heat that is at times oppressive. A foreigner's visit induces the completely naked children to half creep out from under the curtain of reindeer skin which separates the sleeping chamber from the exterior tent, in which, as it is not heated, the

temperature is generally little higher than that of the air outside. In this temperature the mothers do not hesitate to show to visitors for some moments their naked children, one or two years of age.

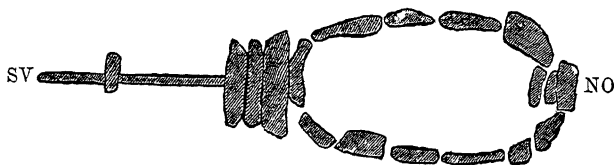
Diseases are notwithstanding uncommon, with the exception that in autumn, before the severe cold commences, nearly all suffer from a cough and cold. Very bad skin eruptions and sores also occur so frequently that a stay in the inner tent is thereby commonly rendered disgusting to Europeans. Some of the sores however are merely frostbites, which most Chukches bring on themselves by the carelessness with which during high winds they expose the bare neck, breast, and wrists to the lowest temperature. When frostbite has happened it is treated, even though of considerable extent, with extreme carelessness. They endeavour merely to thaw the frozen place as fast as possible partly by chafing, partly by heating. On the other hand we never saw any one who had had a deep frostbite on the hands or feet, a circumstance which must be ascribed to the serviceable nature of their shoes and gloves. From the beginning of October 1878 to the middle of July 1879 no death appears to have happened at any of the encampments near us. During the same time the number of the inhabitants was increased by two or three births. During the wife's pregnancy the husband was very affectionate to her, gave her his constant company in the tent, kissed and fondled her frequently in the presence of strangers, and appeared to take a pride in showing her to visitors.

We had no opportunity of witnessing any burial or marriage. It appears as if the Chukches sometimes burn their dead, sometimes expose them on the *tundra* as food for beasts of prey, with weapons, sledges, and household articles. They have perhaps begun to abandon the old custom of burning the dead, since the hunting has fallen off so that the supply of blubber for burning has diminished.

In the spring of 1879, after the snow was melted, we had opportunities of seeing a large number of burying-places, or more correctly of places where dead Chukches had been laid out. They

were marked by stones placed in a peculiar way, and were measured and examined in detail by Dr. Stuxberg, who gives the following description of them:—

“The Chukchi graves on the heights south of Pitlekai and Yinretlen, which were examined by me on the 4th and 7th July, 1879, were nearly fifty in number. Every grave consisted of an oval formed of large lying stones. At one end there was generally a large stone raised on its edge, and from the opposite end there went out one or two pieces of wood lying on the ground. The area within the stone circle was sometimes overlaid with small stones, sometimes free and overgrown with grass. At all the graves, at a distance of four to seven paces from the stone standing on its edge in the longitudinal axis of the grave or a little to the side of it, there was another smaller circle of stones

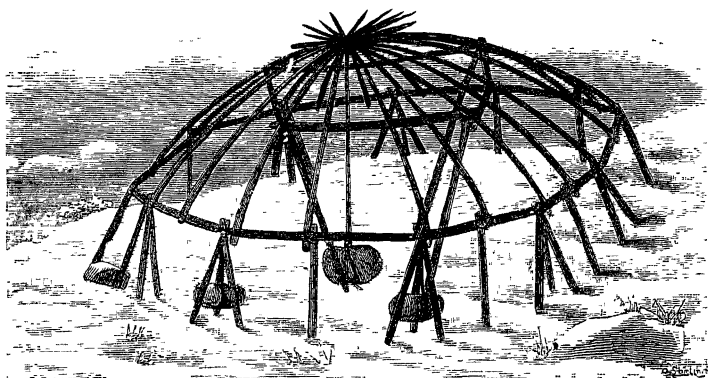


PLAN OF A CHUKCH GRAVE.
(After a drawing by A. Stuxberg.)

inclosing a heap of reindeer horns, commonly containing also broken seals' skulls and other fragments of bones. Only in one grave were found pieces of human bones. The graves were evidently very old, for the bits of wood at the ends were generally much decayed and almost wholly covered with earth, and the stones were completely overgrown with lichens on the upper side. I estimate the age of these graves at about two hundred years.”

The Chukches do not dwell in snow huts, nor in wooden houses, because wood for building is not to be found in the country of the coast Chukches, and because wooden houses are unsuitable for the reindeer nomad. They live summer and winter in tents of a peculiar construction, not used by any other race. For in order to afford protection from the cold the tent is double; the outer envelope inclosing an inner tent or sleeping

chamber. This has the form of a parallelopiped, about $11\frac{1}{2}$ feet long, eight feet broad, and $5\frac{1}{2}$ feet high. It is surrounded by thick, warm, reindeer skins, and is further covered with a layer of grass. The floor consists of a walrus skin stretched over a foundation of twigs and straw. At night the floor is covered with a carpet of reindeer skins, which is taken away during the day. The rooms at the sides of the inner tent are also shut off by curtains, and serve as pantries. The inner tent is warmed by three train-oil lamps, which together with the heat given off by the numerous human beings packed together in the tent, raise



TENT FRAME AT PITLEKAI
(After a drawing by G. Bove.)

the temperature to such a height that the inhabitants even during the severest winter cold may be completely naked. The work of the women and the cooking are carried on in winter in this tent-chamber, very often also the calls of nature are obeyed in it. All this conduces to make the atmosphere prevailing there unendurable. There are also, however, more cleanly families, in whose sleeping chamber the air is not so disgusting.

In summer they live during the day, and cook and work, in the outer tent. This consists of seal and walrus skins sewed together, which however are generally so old, hairless, and full of holes, that they appear to have been used by several generations.

The skins of the outer tent are stretched over wooden ribs, which are carefully bound together by thongs of skin. The ribs rest partly on posts, partly on tripods of driftwood. The posts are driven into the ground, and the tripods get the necessary steadiness by a heavy stone or a seal-skin sack filled with sand being suspended from the middle of them. In order further to steady the tent a yet heavier stone is in the same way suspended by a strap from the top of the tent-roof, or the summit of the roof is made fast to the ground by thick thongs. At one place a tackle from a wrecked vessel was used for this purpose, being tightened with a block between the top of the roof and an iron hook frozen into the ground. The ribs in every tent are besides supported by T-formed cross stays.

The entrance consists of a low door, which, when necessary, may be closed with a reindeer skin. The floor of the outer tent consists of the bare ground. This is kept very clean, and the few household articles are hung up carefully and in an orderly manner along the walls on the inner and outer sides of the tent. Near the tent are some posts, as high as a man, driven into the ground, with cross-pieces on which skin boats, oars, javelins, &c., are laid, and from which fishing and seal nets are suspended.

In the neighbourhood of the dwellings the storehouse is placed. It consists of a cellar excavated at some suitable place. The sites of old Onkilon dwellings are often used for this purpose. The descent is commonly covered with pieces of driftwood which are loaded with stones; at one place the door, or rather the hatch, of the cellar consisted of a whale's shoulder-blade. In consequence of the unlimited confidence which otherwise was wont to prevail between the natives and us, we were surprised to find them unwilling to give the *Vega* men admittance to their storehouses. Possibly the report of our excavations for old implements at the sites of Onkilon dwellings at Irkaipi had spread to Kolyuchin and been interpreted as attempts at plunder.

The tents were always situated on the sea-shore, generally on the small neck of land which separates the coast lagoons from the sea. They are erected and taken down in a few hours. A Chukchi family can therefore easily change their place of

residence, and do remove very often from one village to another. Sometimes they appear to own the wooden frame of a tent at several places, and in such cases at removal there are taken along only the tent covering, the dogs, and the most necessary skin and household articles. The others are left without inclosure, lock, or watch, at the former dwelling-place, and the family are certain to find all untouched on their return. During short stays at a place there are used, even when the temperature of the air is considerably under the freezing-point, exceedingly defective tents or huts made with the skin boats that may happen to be available. Thus a young couple who returned in spring to Pitlekai lived happy and content in a single thin and ragged tent or conical skin hut which below where it was broadest was only two and a half metres across. An accurate inventory, which I took during the absence of the newly married pair, showed that their whole household furniture consisted of a bad lamp, a good American axe, some reindeer skins, a small piece of mirror, a great many empty preserve tins from the *Vega*, which among other things were used for cooking, a fire-drill, a comb, leather for a pair of moccasins, some sewing implements, and some very incomplete and defective tools.

The boats are made of walrus skin, sewed together and stretched over a light framework of wood and pieces of bone. The different parts of the framework are bound together with thongs of skin or strings of whalebone. In form and size the Chukches' large boat, *atkuat*, called by the Russians *baydar*, corresponds completely with the Greenlander's *umiak* or woman's boat. It is so light that four men can take it upon their shoulders, and yet so roomy that thirty men can be conveyed in it. One seldom sees *anatkuat*, or boats intended for only one man; they are much worst built and uglier than the Greenlander's *kayak*. The large boats are rowed with broad-bladed oars, of which every man or woman manages only one. By means of these oars a sufficient number of rowers can for a little raise the speed of the boat to six miles per hour. Like the Greenlanders, however, they often cease rowing in order to rest, laugh, and chatter, then row furiously for some minutes, rest themselves again, row rapidly, and so on.

When the sea is covered with thin newly formed ice they put two men in the fore of the boat with one leg over in order to trample the ice in pieces.



CHUKCHI OAR.
One-sixteenth of
the natural size.

During the winter the boats are laid up, and instead the dog-sledges are put in order. These are of a different construction from the Greenland sledges, commonly very light and narrow, made of some flexible kind of wood, and shod with plates of whales' jawbones, whales' ribs, or whalebone. In order to improve the running, the runners before the start are carefully covered with a layer of ice about one-tenth of an inch in thickness by repeatedly pouring water over them.¹ The different parts of the sledge are not fastened together by nails, but are bound together by strips of skin or strings of whalebone. On the low uncomfortable seat there commonly lies a piece of skin, generally of the Polar bear. The number of dogs that are harnessed to each sledge is variable. I have seen a Chukchi riding behind two small lean dogs, which however appeared to draw their heavy load over even hard snow without any extraordinary exertion. To other sledges I have seen ten or twelve dogs, and a sledge laden with goods was drawn by a team of twenty-eight. The dogs are generally harnessed one pair before another to a long line common to all, sometimes in the case of short excursions more than two abreast, or so irregularly that their position in relation to the sledge appears to have depended merely on the accidental length of the draught-line and the caprice of the driver. The dogs are guided not by reins but by continual crying and shouting, accompanied by lashes from a long whip. There is, besides, in every properly equipped

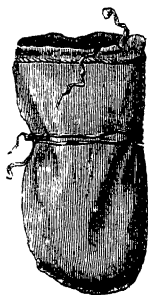
¹ If the runners are not shod with ice in this way the friction between them and the hard snow is very great during severe cold, and the draught accordingly exceedingly heavy.

sledge a short and thick staff mounted with iron, with a number of iron rings attached to the upper end. When nothing else will do, this staff is thrown at the offending animal. The staff is so heavy that the animal may readily get its death by such a throw. The dogs know this, and in consequence are so afraid of this grim implement that the rattling of the rings is sufficient to induce them to put forth extreme efforts. During rests the team is tied to the staff, which is driven into the snow.

The dog harness is made of inch-wide straps of skin, forming a neck or shoulder band, united on both sides by a strap to a girth, to one side of which the draught strap is fastened. Thanks to the excellent protection against the harness which the bushy coat of the dogs affords, little attention is needed, and I have never seen a single dog that was idle in consequence of harness sores. On the other hand, their feet are often hurt by the sharp snow. On this account the equipment of every sledge embraces a number of dog shoes of the appearance shown in the accompanying woodcut. They are used only in case of need.

The Chukchi dogs are of the same breed, but smaller than the Eskimo dogs in Danish Greenland. They resemble wolves, are long-legged, long-haired, and shaggy. The ears are short, commonly upright; their colour very variable, from black or white, and black or white spotted, to grey or yellowish-brown. For innumerable generations they have been used as draught animals, while as watch-dogs they have not been required in a country where theft or robbery appears never to take place. The power of barking they have therefore completely lost, or perhaps they never possessed it. Even a European may come into the outer tent without any of the dogs there making a sound to inform their owners sleeping in the inner tent of the foreigner's arrival.

On the other hand, they are good though slow draught animals, being capable of long-continued exertion. They are as dirty and



One-third of the
natural size.

as peaceable as their owners. There are no fights between dog-teams belonging to different tents, and they are rare between the dogs of an encampment and those of strangers. In Europe dogs are the friends of their masters and the enemies of each other; here they are friends of each other and the slaves of their masters. In winter they appear in case of necessity to get along with very little food; they are then exceedingly lean, and for the most part lie motionless in some snow-drift. They seldom leave the neighbourhood of the tent alone, not even to search for food or hunt on their own account. This appears to me all the more remarkable, that they are often several days, I am inclined to say weeks, in succession without getting any food from their masters. We had two Scotch collies with us on the *Vega*. They at first frightened the natives very much with their bark. To the dogs of Chukches they soon took the same superior standing as the European claims for himself in relation to the savage. The dog was distinctly preferred by the female Chukchi canine population, and that too without the fights to which such favour on the part of the fair commonly gives rise. A numerous canine progeny of mixed Scotch-Chukchi breed has thus arisen at Pitlekai. The young dogs had a complete resemblance to their father, and the natives were quite charmed with them.

The dress of the Chukches is made of reindeer or seal-skin. The former, because it is warmer, is preferred as material for the winter dress. The men in winter are clad in two *pesks*; that which is worn next the body is of thin skin with the hair inwards, the outer is of thick skin with the hair outwards. Besides, they wear, when it rains or sleet falls, a great coat of gut or of cotton cloth, which they call *calico*. On one occasion I saw such an overcoat made of a kind of reindeer leather like chamois, which was of excellent quality and evidently of home manufacture. It had been originally white, but was ornamented with broad brown painted borders. Some red and blue woollen shirts which we gave them were also worn above the skin clothes, and by their showy colours gave great satisfaction to the owners. The Chukchi *pesk* is shorter than the Lapp one. It does not reach quite to the knees, and is confined at the waist with a belt,

Under the *pesk* are worn two pairs of trousers, the inner pair with the hair inwards, and the outer with the hair outwards. The trousers are well made, close fitting, and terminate above the foot. The foot-covering consists of reindeer or seal-skin moccasins, which above the foot are fastened to the trousers in the way common among the Lapps. The soles are of walrus-skin or bear-skin, and have the hair side inwards. On the other parts of the moccasin the hair is outwards. Within the shoes are seal-skin stockings and hay. The head covering consists of a hood embroidered with beads, over which in severe cold is drawn an outer hood bordered with dog-skin. The outer hood is often quite close under the chin, and extends in a very well-fitting way over the shoulders. To a complete dress there also belong a skin neckerchief or boa, and a neck covering of multiple reindeer-skins, or of different kinds of skins sewn together in chess-board like squares. In summer and far into the autumn the men go bareheaded, although they clip the hair on the crown of the head close to the root.

During the warm season of the year the winter wraps are gradually laid off in proportion to the increase of the heat, so that the dress finally consists merely of a *pesk*, an overcoat, and a pair of trousers. The summer moccasins are often as long in the leg as our sea-boots. In the tent the men wear only short trousers reaching to the hip, together with leather belts (health-belts) at the waist and on the arms. The men's dress is not much ornamented. On the other hand the men often wear strings of beads in the ears, or a skin band set with large, tastefully arranged beads or a leather band with some large beads on the brow. The leather band they will not willingly part with, and a woman told us that the beads in it indicate the number of enemies the wearer has killed. I am, however, quite certain that this was only an empty boast. Probably our informant referred to a tradition handed down from former warlike periods to the present time, and thus we have here only a Chukchi form of the boasting about martial feats common even among civilised nations.

To the dress of the men there belongs further a shade for the

eyes, which is often beautifully ornamented with beads and silver mounting. This shade is worn especially in spring as a protection from the strong sunlight reflected from the snow-plains. At this season of the year snow-blindness is very common, but notwithstanding this snow-spectacles of the kind which the Eskimo and even the Samoyeds use are unknown here.

The men are not tattooed, but have sometimes a black or red cross painted on the cheek. They wear the hair cut close to the



CHUKCHI FACE-TATTOOING.
(After a drawing by A. Stuxberg.)

root, with the exception of a short tuft right on the crown of the head and a short fringe above the brow. The women have long hair, parted right in the middle, and plaited along with strings of beads into plaits which hang down by the ears. They are generally tattooed on the face, sometimes also on the arms or other parts of the body. The tattooing is done by degrees; possibly certain lines are first made at marriage.

The dress of the women, like that of the men, is double during

winter. The outer *pesk*, which is longer and wider than the man's, passes downwards into a sort of very wide trousers. The sleeves too are exceedingly wide, so that the arm may easily be drawn in and stuck out. Under the outer *pesk* there is an inner *pesk*, or skin shirt, and a pair of very short trousers is worn. Where the outer *pesk* ends the moccasins begin. At the neck the *pesk* is much cut away, so that a part of the back is bare. I have seen

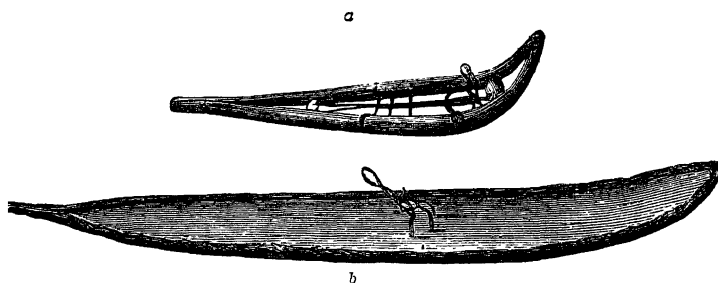


CHUKCHI CHILDREN.

a Girl from Irgunnuk (After a photograph by L. Palander.) *b* Boy from Pitilekai, with his mother's hood on. (After a drawing by the seaman Hansson)

girls go with the upper part of the back exposed in this way even in a cold of -30° or -40° . The stockings have the hair inwards, are bordered with dog-skin and reach to the knees. The moccasins, chin-covers, hoods, and neckerchiefs differ little from the corresponding articles of men's dress. The woman's dress is in general more ornamented than the man's, and the skins used for it appear to be more carefully chosen and prepared. In the

inner tent the women go nearly naked, only with quite short under-trousers of skin or *calico* or a narrow *cingulum pudicitiae*. On the naked body there are worn besides one or two leather bands on one arm, a leather band on the throat, another round the waist, and some bracelets of iron or less frequently of copper on the wrists. The younger women however do not like to show themselves in this dress to foreigners, and therefore hasten at their entrance to cover the lower part of the body with the *pesk*, or some other piece of dress that may be at hand.



SNOW-SHOES.

a. The common kind. b. Intended to be used in the way shown in the drawing on the opposite page.

(One-thirteenth of the natural size.)

When the children are some years old they get the same dress as their parents, different for boys and girls. While small they are put into a wide skin covering with the legs and arms sewed together downwards. Behind there is a four-cornered opening through which moss (the white, dead part of *Sphagnum*), intended to absorb the excreta, is put in and changed. At the ends of the arms two loops are fastened, through which the child's legs are passed when the mother wishes to put it away in some corner of the tent. The dress itself appears not to be changed until it has become too small. In the inner tent the children go completely naked.

Both men and women use snow-shoes during winter. Without

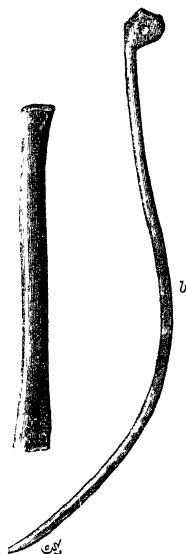
them they will not willingly undertake any long walk in loose snow. They consider such a walk so tiresome, that they loudly commiserated one of my crew, who had to walk without snow-shoes after drifting weather from the village Yinretlen to the vessel, about a mile and a half distant. Finally a woman's compassion went so far that she presented him with a pair; an instance of generosity on the part of our Chukchi friends which otherwise was exceedingly rare. The frame of the snow-shoes is made of wood, the cross-pieces are of strong and well-stretched thongs. This snow-shoe corresponds completely with that of the



AN AINO MAN SKATING AFTER A REINDEER
(Japanese drawing.)

Indians, and is exceedingly serviceable and easy to get accustomed to. Another implement for travelling over snow was offered by a Chukchi who drove past the vessel in the beginning of February. It consisted of a pair of immensely wide skates of thin wood, covered with seal-skin, and raised at both sides. I had difficulty in understanding how these broad shapeless articles could be used with advantage until I learned from the accompanying drawing that they may be employed as a sort of double sledge. The drawing is taken from a Japanese work, whose title when translated, runs thus : A Journey to the north part of Japan (Yezo), 1804 (No. 565 of the Japanese library I brought home with me).

In consequence of the difficulty which the Chukchi has during winter in procuring water by melting snow over the train-oil lamp, there can be no washing of the body at that season of the year. Faces are however whipped clean by the drifting snow, but at the same time are generally swollen or sore from frost-bite. On the whole, the disposition of the Chukches to cleanliness is

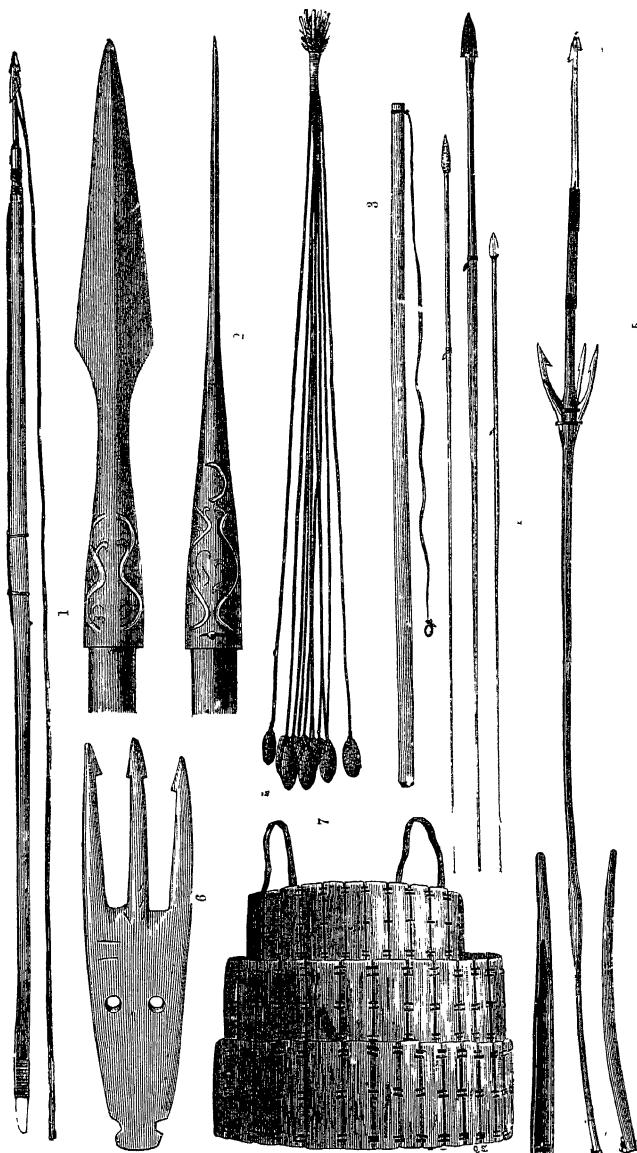


a. HUNTING CUP (sucking tube). (One-fourth of the natural size.)

b. SNOW-SCRAPER (One-eighth of the natural size.)

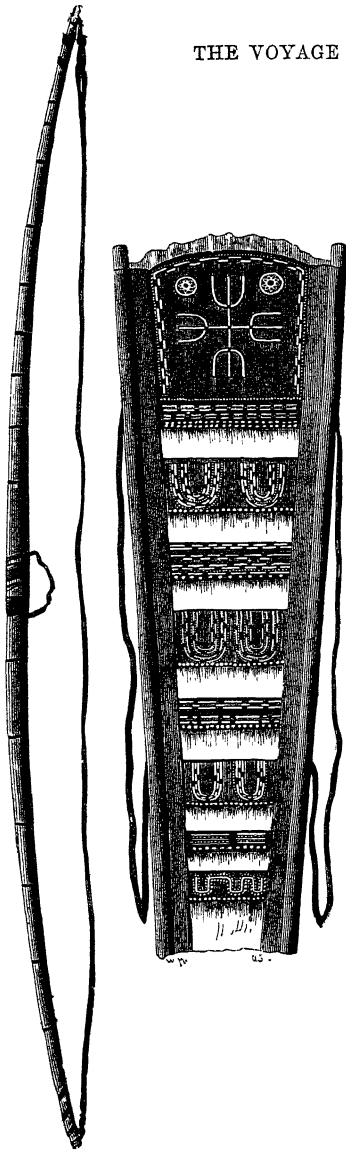
slight, and above all, their ideas of what is clean or unclean differs considerably from ours. Thus the women use urine as a wash for the face. At a common meal the hand is often used as a spoon, and after it is finished, a bowl filled with newly-passed urine instead of water is handed round the company for washing the hands. Change of clothes takes place seldom, and even when the outer dress is clean, new and well cut, of carefully-chosen beautiful skins, the under-dress is very dirty, and vermin numerous enough, though less so than might have been expected. Food is often eaten in a way which we consider disgusting, a titbit, for instance, is passed from mouth to mouth. The vessels in which food is served are used in many ways and seldom cleaned. On the other hand it may be stated that, in order not to make a stay in the confined tent-chamber too uncomfortable, certain rules are strictly observed. Thus, for instance, it is not permitted in the interior of the tent to spit on the floor, but this must be done into a vessel which in case of necessity is

used as a night-utensil. In every outer tent there lies a specially carved reindeer horn, with which snow is removed from the clothes; the outer *pesk* is usually put off before one goes into the inner tent and the shoes are carefully freed from snow. The carpet of walrus-skin, which covers the floor of the inner tent, is accordingly dry and clean. Even the outer tent is swept clean



CHUKCHI WEAPONS AND HUNTING IMPLEMENTS

1. Harpoon (one-fifteenth of the natural size). 2. Spear found at a grave (one-fourth). 3. Bird sling (one eighth). 4. Darts with whip-sling for casting them (one-seventh). 5. Fish-Spear of bone (one-fourth). 6. Ivory coat of mail (one-ninth).



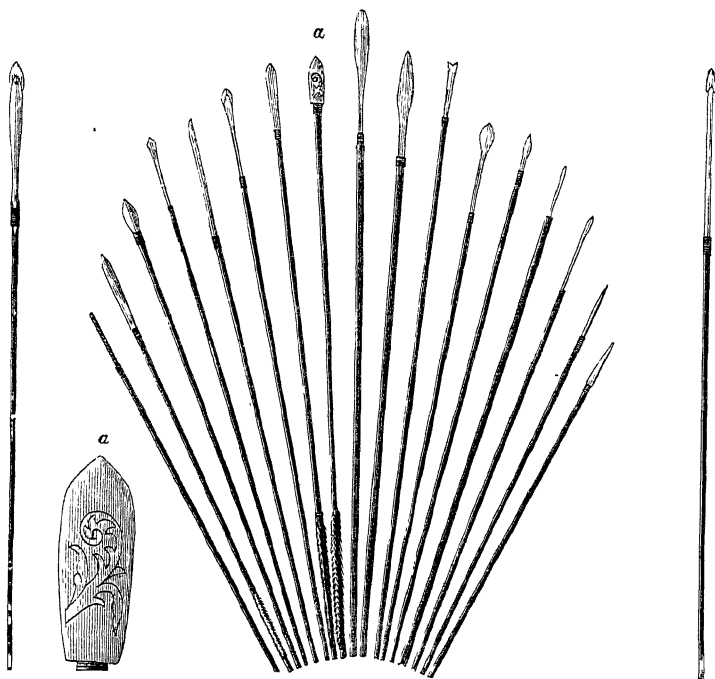
CHUKCHI BOW AND QUIVER.
(One-eighth of the natural size.)

and free from loose snow, and the snow is daily shovelled away from the tent doors with a spade of whalebone. Every article both in the outer and inner tent is laid in its proper place, and so on.

As ornaments glass beads are principally used, some of them being suspended from the neck and ears, others sewed upon the hood and other articles of dress, or plaited into the hair. Embroidery of very pleasing patterns is also employed. In order to embellish the *pesks* strips of skin or marmots' and squirrels' tails, &c., are sewed upon them. Often a variegated artificial tail of different skins is fixed to the hood behind, or the skin of the hood is so chosen that the ears of the animal project on both sides of the head. Along with the beads are fixed amulets, wooden tongs, small bone heads or bone figures, pieces of metal, coins, &c. One child had suspended from its neck an old Chinese coin, with a square hole

in the middle, together with a new American five-cent piece.

In former times beautiful and good weapons were probably highly prized by so warlike a people as the Chukches, but now



CHUKCHI ARROWS.

(One-ninth of the natural size.) a. An arrowhead (one-half the natural size)

weapons are properly scarce antiquities, which, however, are still regarded with a certain respect, and therefore are not readily parted with. The lance which was found beside the corpse (figure 2 on p. 301) shows by its still partially preserved gold decorations that it had been forged by the hand of an artist.

Probably it has formed part of the booty won long ago in the fights with the Cossacks. I procured by barter an ivory coat of mail (fig. 7 on p. 301), and remains of another. The ivory plates of the coat of mail are 4·7 inches in length, one and a half in breadth, and nearly two-fifths in thickness, holes being bored at their edges for the leather thongs by which the plates are bound together. This binding has been so arranged that the whole coat of mail, when not in use, may be rolled together.

Along with the spear and the coat of mail the old Chukches used the bow for martial purposes. Now this weapon is employed only for hunting, but it appears as if even for this purpose it would soon go out of use. Some of the natives, however, use the bow with great accuracy of aim. The bows which I procured commonly consisted of a badly-worked, slightly bent, elastic piece of wood, with the ends drawn together by a skin thong. Only some old bows had a finer form. The arrows are of many kinds, partly with bone or wooden, and partly with iron, points. Feathers are generally wanting. The shaft is a clumsily worked piece of wood. Crossbows are occasionally used.

The principal livelihood of the Chukches is derived from hunting and fishing. Both are very abundant at certain seasons of the year, but are less productive during the cold season, in which case, in consequence of the improvidence of the savage, there arises great scarcity both of food and fuel and the means of melting snow. Of their hunting and fishing implements I cannot give so complete accounts as I should wish, because they very carefully avoided taking any of the *Vega's* hunters with them on their hunting excursions.

The rough seal is taken with nets, made of strong seal-skin thongs. The nets are set in summer among the ground-ice along the shore. The animal gets entangled in the net and is suffocated, as it can no longer come to the surface to breathe. In winter the seal is taken partly with nets in "leads" among the ice, partly with the harpoon when it crawls out of its hole; it is also taken by means of a noose of thongs placed over its hole. The bear is killed by the lance or knife, the latter, according to the statement of a Chukchi, being the surest weapon; the walrus and

the largest kind of seals with the harpoon (fig 1, p. 301), or a lance resembling the Greenlander's. Even the whale is harpooned, but with a harpoon considerably larger than the common one, and to which as many as six inflated seal-skins are fastened. Birds are taken in snares, or killed with bird-javelins, arrows, and slings, the last mentioned (fig. 3, p. 301) consist of a number of round balls of bone fastened to leather thongs, which are knotted together. When the sling is thrown the bone balls are thereby scattered in all directions, and the probability of hitting becomes greater. Common slings are also used, consisting of two thongs and a piece of skin fastened to them. The bird dart (fig. 5, p. 301) completely resembles that used by the Eskimo.

Fish are caught partly with nets, partly with the hook or with a sort of spear (fig. 6, p. 301). The nets are made of sinew-thread. The fishing-rod consists of a shaft only a foot long, to which is fixed a short line made of sinews. The extreme end of the line passes through a large sinker of ivory, to which are attached two or three tufts each with its hook of bone only, or of bone and copper, or bone and iron. The hook has three or four points projecting in different directions.

Even for the coast Chukchi reindeer flesh appears to form an important article of food. He probably purchases his stock of it from the reindeer-Chukches for train-oil, skin traps, walrus tusks, and perhaps fish.

Besides fish and flesh the Chukches consume immense quantities of herbs and other substances from the vegetable kingdom.¹ The most important of these are the leaves and young branches of a great many different plants (for instance *Salix*, *Rhodiola*, &c.) which are collected and after being cleaned are preserved in seal skin sacks. Intentionally or unintentionally the contents of the sacks sour during the course of the summer. In autumn they freeze together to a lump of the form of the stretched seal-skin. The frozen mass is cut in pieces and used with flesh, much in the same

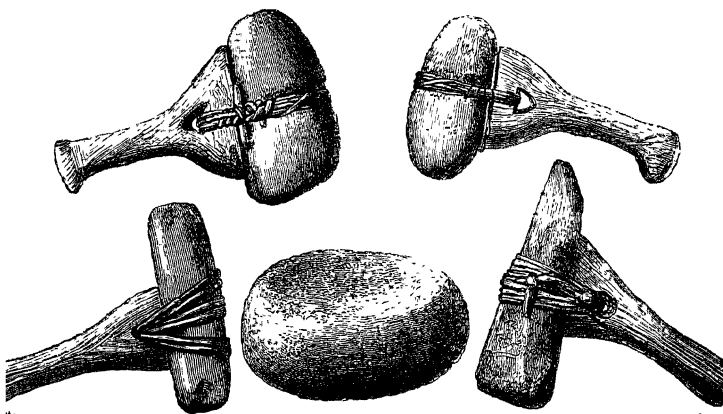
¹ An exhaustive treatise on the food-substances which the Chukches gather from the vegetable kingdom, written by Dr. Kjellman, is to be found in *The Scientific Work of the Vega Expedition*. Popov states that the Chukches eat many berries, roots, and herbs (*Muller*, iii. p. 59).

way as we eat bread. Occasionally a vegetable soup is made from the pieces along with water, and is eaten warm. In the same way the contents of the reindeer stomach is used. Algæ and different kinds of roots are also eaten, among the latter a kind of wrinkled tubers, which have a very agreeable taste.

In summer the Chukches eat cloud-berries, red bilberries, and other berries, which are said to be found in great abundance in the interior of the country. The quantity of vegetable matter which is collected for food at that season of the year is very considerable, and the natives do not appear to be very particular in their choice, if the leaves are only green, juicy, and free from any bitter taste. The writers who quote the Chukches as an example of a race living exclusively on substances derived from the animal kingdom thus commit a complete mistake. To judge from the Chukches our primitive ancestors by no means so much resembled beasts of prey as they are commonly imagined to have done, and it may, perhaps, have been the case that "*bellum omnium inter omnes*" was first brought in with the higher culture of the Bronze or Iron Age.

The cooking of the Chukches, like that of most wild races, is very simple. After a successful catch all the dwellers in the tent gormandise on the killed animal, and appear to find a special pleasure in making their faces and hands as bloody as possible. Fish is eaten not only in a raw state, but also frozen so hard that it can be broken in pieces. When opportunity offers the Chukches do not, however, neglect to boil their food, or to roast pieces of flesh over the train-oil lamp—the word *roast* ought however in this case to be exchanged for *soot*. At a visit which Lieutenant Hovgaard made to Naitskai, the natives in the tent where he was a guest ate for supper first seal-flesh soup, then boiled fish, and lastly, boiled seal-flesh. They thus observed completely the order of eating approved in Europe. As examples of Chukchi dishes I may further mention, vegetable soup, boiled seal-flesh, boiled fish, blood soup, soup of seal-blood and blubber. To these we may add soup from finely crushed bones, or from seal-flesh, blubber, and bones. The bones which are used for food are finely crushed against a stone anvil or a whale's vertebra, and

then boiled with water and blood, before being eaten. The hammer used in crushing bones is of interest as forming one of the stone implements which are most frequently found in graves from the Stone Age. That the hammer was mainly intended for kitchen purposes appears from the circumstance that the women alone had it at their disposal, and were consulted when it was parted with. Along with such hammers there was to be found in every tent an anvil, consisting of a whale's vertebra



STONE HAMMERS AND ANVIL FOR CRUSHING
(One-sixth of the natural size)

or a large round stone with a bowl-formed depression worn or cut out in the middle of it.

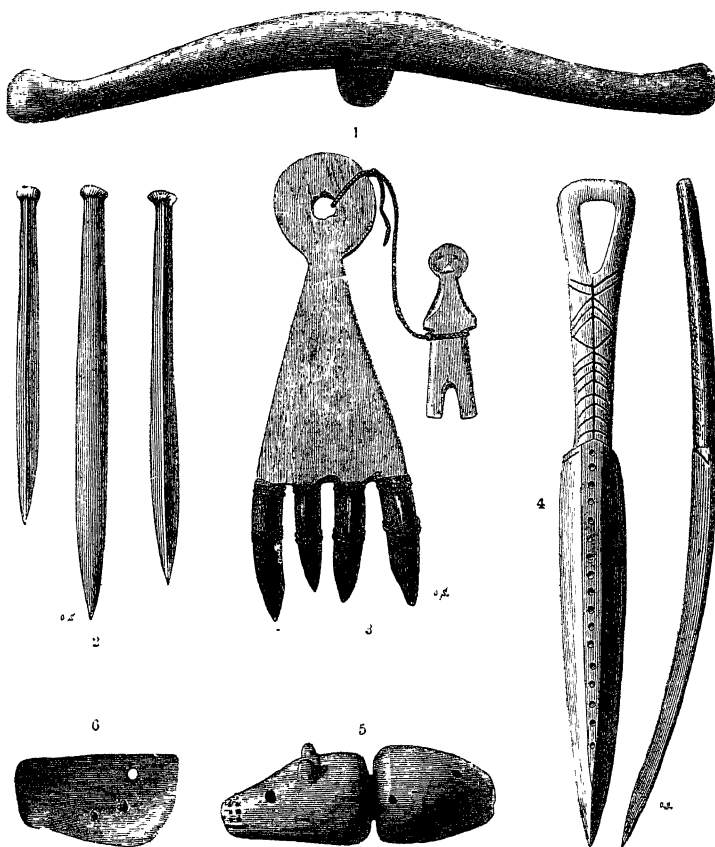
Spirits, to which they are exceedingly addicted, they call, as has been already stated, in conversation with Europeans, "ram," the utterance of the word being often accompanied by a hawking noise, a happy expression, and a distinctive gesture, which consisted in carrying the open right hand from the mouth to the waist, or in counterfeiting the unintelligible talk of a drunken man. Among themselves they call it fire-water (*akmimil*). The promise of it was the most efficient means

of getting an obstinate Chukchi to comply with one's wishes. That drunkenness, not the satisfying of the taste, was the main object, is shown by the circumstance that they often fixed, as price for the articles they saw we were anxious to have, such a quantity of brandy as would make them completely intoxicated. When on one occasion I appeared very desirous of purchasing a fire-drill, which was found in a tent inhabited by a newly-wedded pair, the young and very pretty housewife undertook the negotiation, and immediately began by declaring that her husband could not part with the fire-producing implement unless I gave him the means of getting quite drunk, for which, according to her statement, which was illustrated by lively gesticulations representing the different degrees of intoxication, eight glasses were required. Under the influence of liquor they are cheerful, merry, and friendly, but troublesome by their excessive caressing. Even the women readily took a glass, though evidently less addicted to intoxicants than the men. They however got their share, as did even the youngest of the children.

Tobacco is in common use, both for smoking and chewing. Every native carries with him a pipe resembling that of the Tungus, and a tobacco-pouch (fig. 1, p. 310). The tobacco is of many kinds, both Russian and American, and when the stock is finished native substitutes are used. The pipes are so small that, like those of the Japanese, they may be smoked out with a few strong whiffs. The smoke is swallowed. Even the women and children smoke and chew, and they begin to do so at so tender an age that we have seen a child, who could indeed walk, but still sucked his mother, both chew tobacco, smoke, and take a "ram."

Some bundles of Ukraine tobacco, which I took with me for barter with the natives, put it in my power to procure a large number of contributions to the ethnological collection, which in the absence of other wares for barter, I would otherwise have been unable to obtain. For the Chukches do not understand money. This is all the more remarkable that they carry on a very extensive trade, and evidently are good mercantile men. According to von Dittmar there exists, or existed in 1856, a

steady, slow, but regular transport of goods along the whole north coast of Asia and America, by which Russian goods were



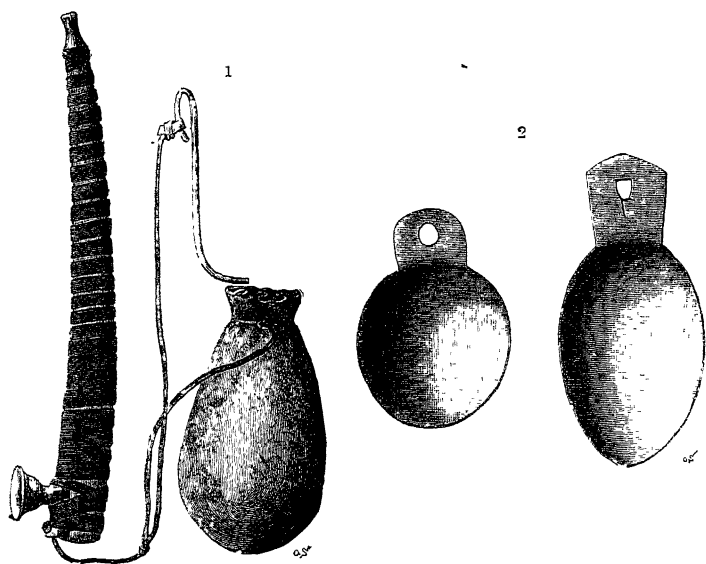
CHUKCHI IMPLEMENTS.

1. Scraper for currying (one-seventh of the natural size). 2. Awls (one-half). 3. Ice-scraper intended for decoying the seal from its hole, with bone amulet affixed (one-half). 4. Bone knife (one-half). 5, 6. Amulets of bone (natural size).

conveyed to the innermost parts of Arctic America, and furs instead found their way to the bazaars of Moscow and St. Peters-

burg. This traffic is carried on at five market places, of which three are situated in America, one on the islands at Behring's Straits, and one at Anjui near Kolyma. The last-mentioned is called by the Chukches "the fifth beaver market."

The Chukches' principal articles of commerce consist of seal-skin, train-oil, fox-skins and other furs, walrus tusks, whalebone,



CHUKCH IMPLEMENTS.

1. Pipe and tobacco-pouch (one-third of the natural size) 2 Metal spoons (one-third)

&c. With these they purchase tobacco, articles of iron, reindeer skin and reindeer flesh, and, when it can be had, spirit. A bargain is concluded very cautiously after long-continued consultation in a whispering tone between those present.

The lamp with which light is maintained in the tent, consists of a flat trough of wood, bone of the whale, soap-stone or burned clay, broader behind than before, and divided by an

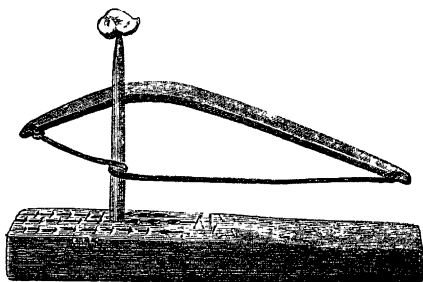
isolated toothed comb into two divisions. In the front division wicks of moss (*Sphagnum* sp.) are laid in a long thin row along the whole edge. Under the lamp there is always another vessel intended to receive the train-oil which may possibly be spilled.

In summer the natives also cook with wood in the open air or in the outer tent, in winter only in the greatest necessity in the latter. For they find the smoke, which the wood gives off in the close tent, unendurable. Although driftwood is to be found in great abundance on the beach, scarcity of train-oil was evidently considered by the natives as a great misfortune as scarcity of food. In the tent the woman has always a watchful eye over the trimming of the lamp and the keeping up of the fire. The wooden pins she uses to trim the wick, and which naturally are drenched with train-oil, are used when required as a light or torch in the outer tent, to light pipes, &c. Train-oil and other liquid wares are often kept in bags of seal-skin, consisting of whole hides, out of which the body has been taken through the opening made by cutting off the head. In one of the forepaws there is inserted with great skill a wooden air and water-tight cock with spigot and faucet.

Fire is lighted partly in the way common in Sweden some decades ago by means of flint and steel, partly by means of a drill implement. In the former case the steel generally consists of a piece of a file or some other old steel tool, or of pieces of iron or steel which have been specially forged for the purpose. Commonly the form of this tool indicates a European or Russo-Siberian origin, but I also acquired clumsily hammered pieces of iron, which appeared to form specimens of native skill in forging. A Chukchi showed me a large fire-steel of the last-mentioned kind, provided with a special handle of copper beautifully polished by long-continued use. The flint consists of a beautiful chalcedony or agate, which has been formed in cavities in the volcanic rocks which occur so abundantly in north-eastern Asia, and which probably are also found here and there as pebbles in the beds of the *tundra* rivers. As tinder, are used partly the woolly hair of various animals, partly dry fragments of different kinds of plants.

The steel and a large number of pieces of flint are kept in a skin pouch suspended from the neck.

The other sort of fire-implement consists of a dry wooden pin, which by a common bow-drill is made to rub against a block of dry half-blackened wood. The upper part of this pin runs in a drill block of wood or bone. In one of the tools which I purchased, the astragalus of a reindeer was used for this purpose. In the light-stock holes have been made to give support to the pin, and perhaps to facilitate the formation of the half-carbonised wood-dust which the drilling loosens from the light-stock and in which the red heat arises. When fire is to be lighted by means



FIRE DRILL.

One-eighth of the natural size.

of this implement, the lower part of the drill pin is daubed over with a little train oil, one foot holds the light-stock firm against the ground, the bowstring is put round the drill pin, the left hand presses the pin with the drill block against the light-stock, and the bow is carried backwards and forwards, not very rapidly, but evenly, steadily, and uninterruptedly, until fire appears. A couple of minutes are generally required to complete the process. The women appear to be more accustomed than the men to the use of this implement. An improved form of it consisted of a wooden pin on whose lower part a lense-formed and perforated block of wood was fixed. This block served as fly-wheel and weight. Across the wooden pin ran a perforated cross-bar which

was fastened with two sinews to its upper end. By carrying this cross-bar backwards and forwards the pin could be turned round with great rapidity. The implement appears to me the more remarkable as it shows a new way of using the stone or brick lenses, which are often found in graves or old house-sites from the Stone Age. Among the Chukches, as among many other wild races, lucifer matches have obtained the honour of being the first of the inventions of the civilised races that have been recognised as indisputably superior to their own.

Among household articles, I may further mention the following:—

The *hide-scraper* (fig. 1, p. 309) is of stone or iron and fastened to a wooden handle. With this tool the moistened hide is cleaned very particularly, and is then rubbed, stretched, and kneaded so carefully that several days go to the preparation of a single reindeer skin. When the skin has been sufficiently worked, it is treated with urine, mixed with comminuted willow bark, which has been dried over the lamp. In order to give this a red colour on one side, the bark of a species of *Pinus* (?) is mixed with the tanning liquid. The skins are made very soft by this process, and on the inner side almost resemble chamois leather. Sometimes too the reindeer skin is tanned to real chamois of very excellent quality.

Two sorts of *ice mattocks*; the shaft is of wood, the blade of the spade-formed one of whalebone, of the others of a walrus tusk; it is fixed to the shaft by skin thongs with great skill. Sometimes both the shaft and blade are of bone, fastened together in a somewhat different way.

Hones of native clay-slate. These are often perforated at one end and carried along with the knife, the spoon, and the sucking-tube, fastened with an ivory tongs in the belt.

Home-made *vessels of wood, bone of the whale, whalebone, and skin* of different kinds.

Knives, boring tools, axes and pots of European, American, or Siberian origin, and in addition casks, pieces of cable, iron scrap, preserved-meat tins, glasses, bottles, &c., obtained from ships which have anchored along the coast.

During our stay off the considerable encampment, Irkaipi, we believed, as I have already stated, that we had found a chief in a native named Chepurin, who, to judge by his dress, appeared to be somewhat better off than the others, had two wives and a stately exterior. He was accordingly entertained in the gunroom,



ICE MATTOCKS

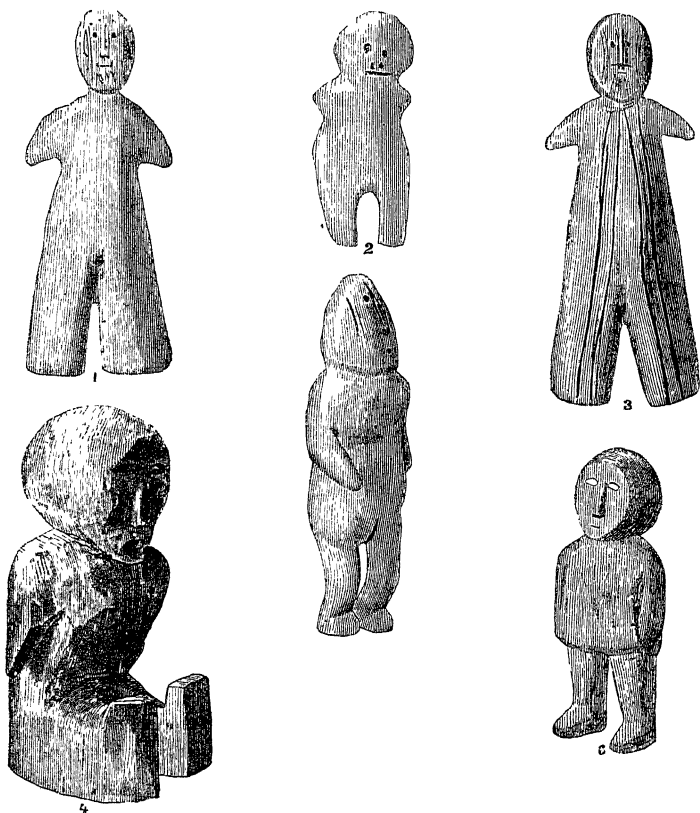
One-ninth of the natural size.

got the finest presents, and was in many ways the object of special attention. Chepurin took his elevation easily, and showed himself worthy of it by a grave and serious, perhaps somewhat condescending behaviour, which further confirmed our supposition and naturally increased the number of our presents. Afterwards,

however, we were quite convinced that we had in this case committed a complete mistake, and that now there are to be found among the Chukches living at the coast neither any recognised chiefs nor any trace of social organisation. During the former martial period of the history of the race the state of things here was perhaps different, but now the most complete anarchy prevails, if by that word we may denote a state of society in which disputes, crimes, and punishments are unknown, or at least exceedingly rare. A sort of chieftainship appears, however, to be found among the reindeer-Chukches living in the interior of the country. At least there are among them men who can show commissions from the Russian authorities. Such a man was the starost Menka, of whose visit I have already given an account. Everything, however, indicated that his influence was exceedingly small. He could neither read, write, nor speak Russian, and he had no idea of the existence of a Russian Czar. All the tribute he had delivered for several years, according to receipts which he showed to us, consisted of some few fox-skins, which he had probably received as market-tolls, at Anjui and Markova. Menka was attended on his visit to the vessel by two ill-clad men with a type of face differing considerably from that common among the Chukches. Their standing appeared to be so inferior that we took them for slaves, although mistakenly, at least with respect to one of them—Yettugin. He afterwards boasted that he owned a much larger reindeer-herd than Menka's, and talked readily, with a certain scorn, of Menka's pretensions to chiefship. According to Russian authors there are actual slaves, probably the descendants of former prisoners of war, among the Chukches in the interior of the country. Among the dwellers on the coast, on the contrary, there is the most complete equality. We could never discover the smallest trace of any man exercising the least authority beyond his own family or his own tent.

The coast Chukches are not only heathens, but are also, so far as we could observe, devoid of any conception of higher beings. They have, however, superstitions. Thus most of them wear round the neck leather straps, to which small wooden tongs, or

wooden carvings are fixed. These are not parted with, and are not readily shown to foreigners. A boy had a band of beads

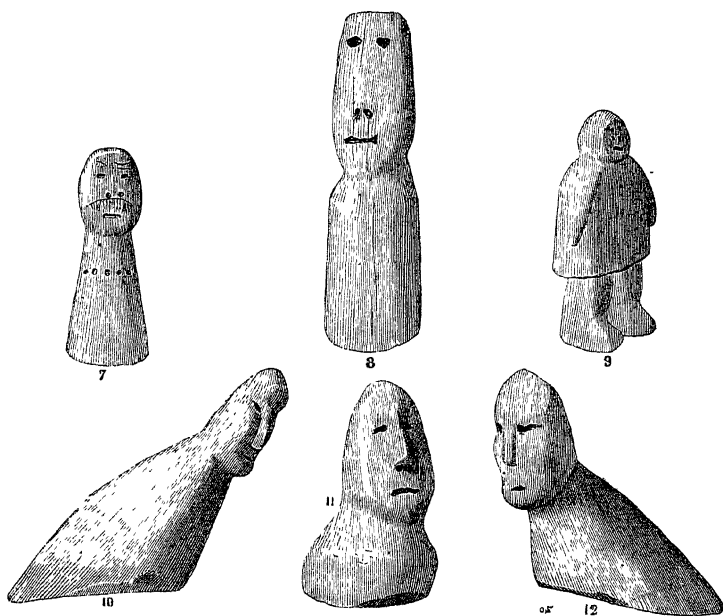


HUMAN FIGURES.

Nos. 1, 3, and 5, represent women with tattooed faces. No. 4 is of wood. No. 6 of wood with eyes of tin.

sewed to his hood, and in front there was fastened an ivory carving, probably intended to represent a bear's head (fig. 6, on p. 309). It was so small, and so inartistically cut, that a man

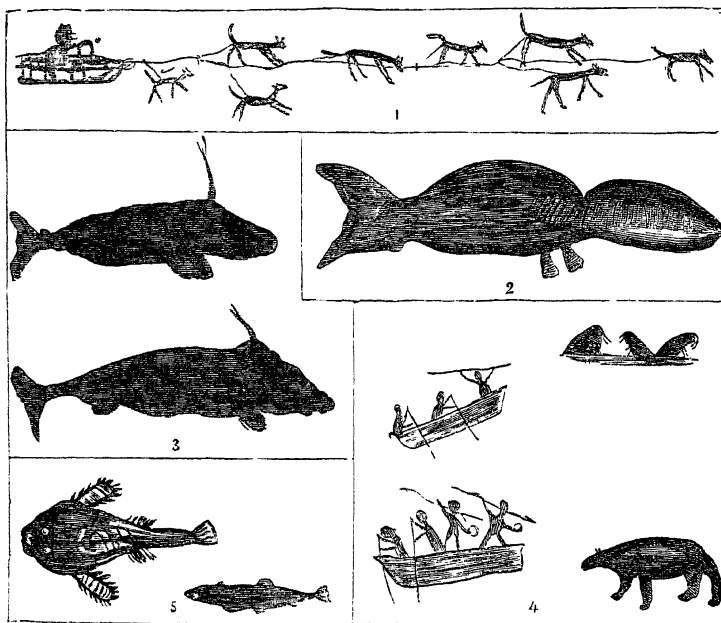
could undoubtedly make a dozen of them in a day. I, however, offered the father unsuccessfully a clasp-knife and tobacco for it, but the boy himself, having heard our bargaining, exchanged it soon after for a piece of sugar. When the father knew this he laughed good-naturedly, without making any attempt to get the bargain undone.



HUMAN FIGURES IN IVORY.

To certain tools small wooden images are affixed, as to the scraper figured above (fig. 3, p. 309), and similar images are found in large numbers in the lumber-room of the tent, where pieces of ivory, bits of agate and scrap iron, are preserved. A selection from the large collection of such images which I made is here reproduced in woodcuts. If these carvings may be considered as

representations of higher beings, the religious ideas which are connected with them, even judged from the Shaman standpoint, are exceedingly indistinct, less a consciousness which still lives among the people, than a reminiscence from former times. Most of the figures bear an evident stamp of the present dress and

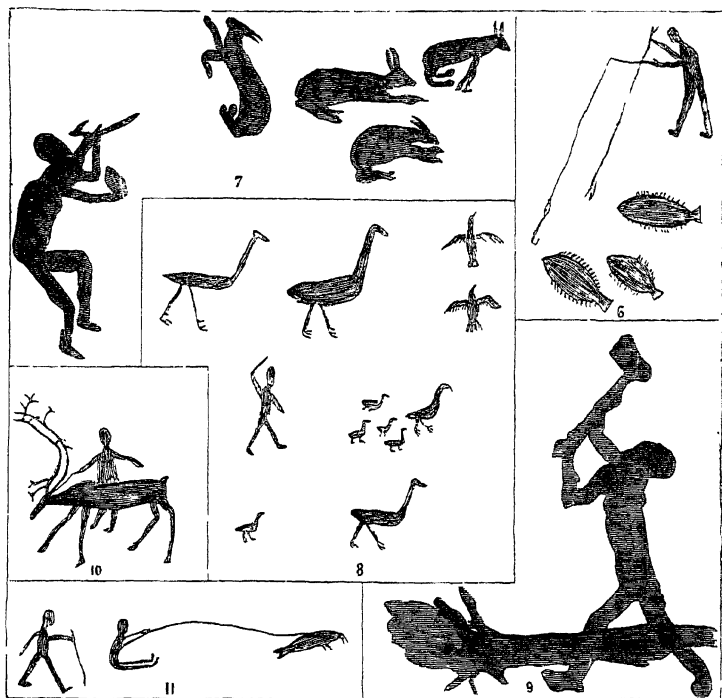


DRAWINGS MADE BY CHUKCHES.

mode of life of the people. It appears to me to be remarkable, that in all the bone or wood carvings I have met with, the face has been cut flatter than it is in reality in this race of men. Some of the carvings appear to remind me of an ancient Buddhist image.

The drum, or more correctly, tambourine, so common among most of the Polar peoples, European, Asiatic, and American,—

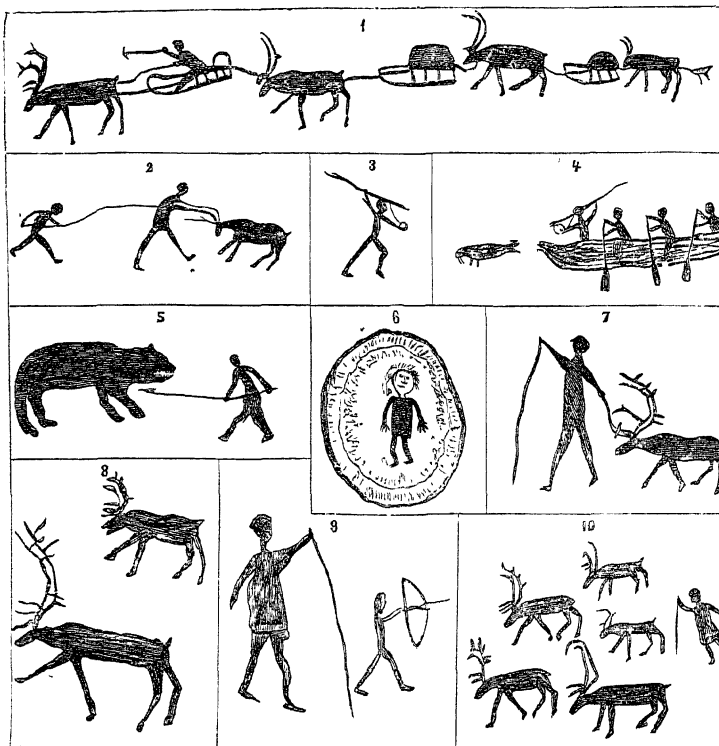
among the Lapps, the Samoyeds, the Tungus, and the Eskimo, is found in every Chukchi tent. A certain superstition is also attached to it. They did not willingly play it in our presence, and they were averse to part with it. If time permitted



DRAWINGS MADE BY CHUKCHES.

it was concealed on our entrance into the tent. The drum consists of the peritoneum of a seal, stretched over a narrow wooden ring fixed to a short handle. The drum-stick consists of a splinter of whalebone eleven and a half to fifteen inches long, which towards the end runs into a point so fine and

flexible, that it forms a sort of whipcord. When the thicker part of the piece of whalebone is struck against the edge of the drum-skin, the other end whips against the middle, and the skin is thus struck twice at the same time. The drum is commonly

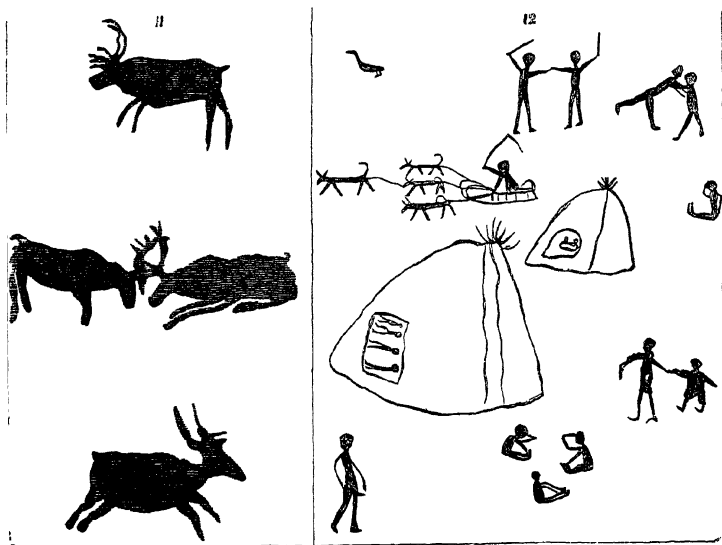


DRAWINGS MADE BY CHUKCHES

played by the man, and the playing is accompanied by a very monotonous song. We have not seen it accompanied by dancing, twisting of the countenance, or any other Shaman trick. We did not see among the Chukches we met with any Shamans.

Besides the drum the Chukches also use as a musical instrument a piece of wood, cloven into halves, and again united after the crack has been somewhat widened in the middle, with a piece of whalebone inserted between the halves.

The dance I saw consisted in two women or children taking each other by the shoulders, and then hopping now on the one

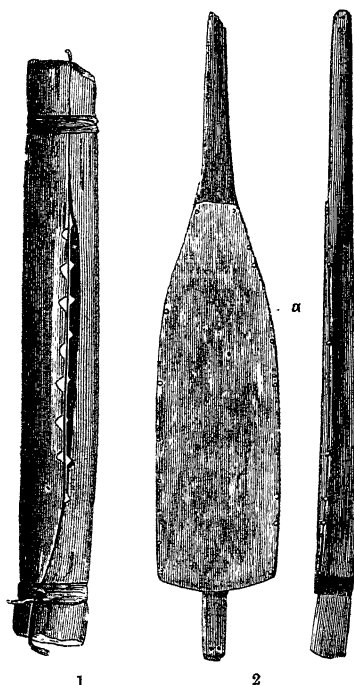


DRAWINGS MADE BY CHUKCHES.

foot now on the other. When many took part in the dance, they placed themselves in rows, sang a monotonous, meaningless song, hopped in time, turned the eyes out and in, and threw themselves, with spasmodic movements clearly denoting pleasure and pain, now to the right, now to the left. "La saison" for dance and song, the time of slaughtering reindeer, however, did not happen during our stay, on which account our experience of the Chukches' abilities in this way is exceedingly limited.

What is the nature of the art-sense of the Chukches? As they still almost belong to the Stone Age, and as their contact with Europeans has been so limited that it has not perhaps conducted to alter their taste and skill in art, this question

appears to me to have a great interest. The historian of art may herein obtain information as to the nature of the seed from which the skill of the master has been developed in the course of ages and millenniums, and the archæologist here finds a starting-point for forming a judgment both of the Scandinavian rock-etchings and the palæolithic drawings, which in recent times have played so great a part in enabling us to understand the oldest history of the human race. We have therefore zealously collected all that we could of Chukchi carvings, drawings, and patterns. The most remarkable of these in one respect or another are to be found delineated in the woodcuts on the preceding pages.¹



MUSICAL INSTRUMENTS.
1. Whistle-pipe, natural size. 2. Whistle-instrument, one-third of natural size: a. mouth-hole

Many of the ivory carvings are old and worn, showing that they have been long in use, probably as amulets. Several of the animal images are the

¹ The originals of the drawings reproduced in the woodcuts are made on paper, part with the lead pencil, part with red ochre. The different groups represent on p. 318—1, a dog-team; 2, 3, whales; 4, hunting the Polar bear and the walrus; 5, bullhead and cod; p. 319—6, man fishing; 7, hare-

fruit of the imagination, and as such may be instructive. In general the carvings are clumsy, though showing a distinctive style. If we compare them with the Samoyed images we brought home with us, it appears that the genius of the Chukches for art has reached an incomparably higher development than that of the Arctic race which inhabits the western portion of the north coast of Asia; on the other hand, they are in this respect evidently inferior to the Eskimo at Port Clarence. The Chukchi drawings too are roughly and clumsily executed, but many of them exhibit a certain power of hitting off the object. These figures appear to me to show that the objections which have been raised to the genuineness of various palæolithic etchings, on the ground of the artist's comparatively sure hand, are not justified. Embroidery is done commonly on red-coloured strips of skin partly with white reindeer hair, partly with red and black wool, obtained in small quantity by barter from Behring's Straits. The supply of colouring material is not particularly abundant. It is obtained partly from the mineral kingdom (limonite of different colours, and graphite), partly from the vegetable kingdom (bark of various trees). The mineral colours are ground with water between flat stones. Bark is probably treated with urine. Red is the Chukches' favourite colour.

Dr. Almquist gives the following as the final result of his investigation on the colour-sense of the Chukches: "That the Chukches in general possess as good an organ for distinguishing colours as we Swedes. On the other hand, they appear not to be accustomed to observe colours, and to distinguish sharply any other colour than red. They bring together all reds as something special, but consider that green of a moderate brightness corresponds less with a green of less brightness than with a blue of the same brightness. In order to bring all greens together

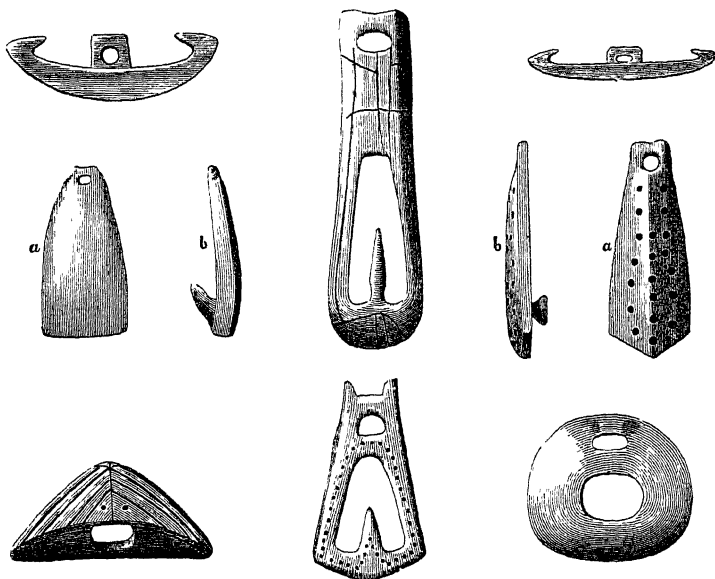
hunting; 8, birds; 9, wood-chopper; 10, man leading a reindeer; 11, walrus hunt—7 and 9 represent Europeans. On page 320—1, a reindeer train; 2, a reindeer taken with a lasso by two men; 3, a man throwing a harpoon; 4, seal hunt from boat; 5, bear hunt; 6, the man in the moon; 7, man leading a reindeer; 8, reindeer; 9, Chukchi with staff and an archer; 10, reindeer with herd; p. 321—11, reindeer; 12, two tents, man riding on a dog sledge, &c.

the Chukches thus require to learn a new abstraction." Of 300 persons who were examined, 273 had a fully developed colour-sense, nine were completely colour-blind, and eighteen incompletely colour-blind, or gave uncertain indications.

From what has been stated above it appears that the coast Chukches are without any perceptible religion, social organisation, or government. Had not experience from the Arctic races of America taught us differently we should have believed that with such a literally anarchic and godless crew there would be no security for life and property, immorality would be boundless, and the weaker without any protection from the violence of the stronger sex. This, however, is so far from being the case that criminal statistics have been rendered impossible for want of crimes, if we except acts of violence committed under the influence of liquor.

During the winter the *Vega* was visited daily, as has been stated in the account of the wintering, by the people from the neighbouring villages, while our vessel at the same time formed a resting-place for all the equipages which travelled from the western tent-villages to the islands in Behring's Straits, and *vice versa*. Not only our neighbours, but people from a distance whom we had never seen before, and probably would not see again, came and went without hindrance among a great number of objects which in their hands would have been precious indeed. We had never any cause to regret the confidence we placed in them. Even during the very hard time, when hunting completely failed, and when most of them lived on the food which was served out on board, the large *dépôt* of provisions, which we had placed on land without special watch, in case any misfortune should befall our vessel, was untouched. On the other hand, there were two instances in which they secretly repossessed themselves of fish they had already sold, and which were kept in a place on deck accessible to them. And with the most innocent countenance in the world they then sold them over again. This sort of dishonesty they evidently did not regard as theft but as a permissible commercial trick.

This was not the only proof that the Chukches consider deception in trade not only quite justifiable, but almost creditable. While their own things were always made with the greatest care, all that they did specially for us was done with extreme carelessness, and they were seldom pleased with the price that was offered, until they became convinced that they could not get more.



CHUKCHI BUCKLES AND HOOKS OF IVORY.

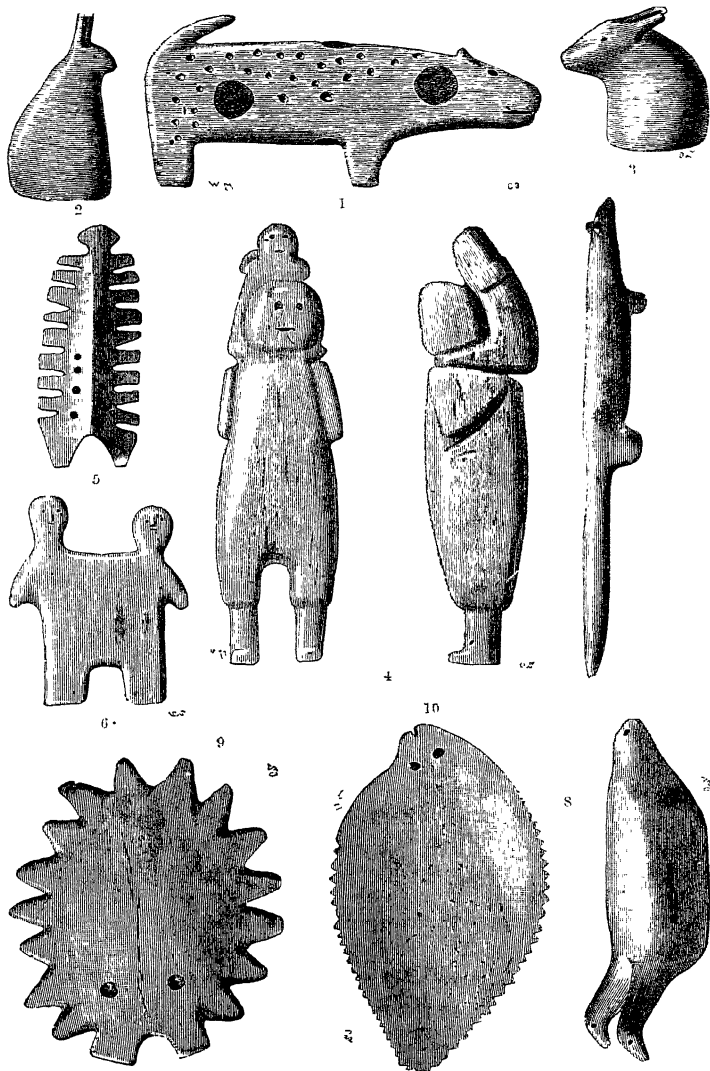
Half the natural size.

When they saw that we were anxious to get ptarmigan, they offered us from their winter stock under this name the young of *Larus eburneus*, which is marked in the same way, but of little use as food. When I with delight purchased this bird, which in its youthful dress is rare, and therefore valuable to the ornithologist, a self-satisfied smile passed over the countenance of the seller. He was evidently proud of his successful trick.

Some prejudice, as has been already stated, prevented the Chukches from parting with the heads of the seal, though, in order to ascertain the species existing here, we offered a high price for them. "Irgatti" (to-morrow), or "Isgatti," if the promise was given by a woman, was the usual answer. But the promise was never kept. At last a boy came and gave us a skull, which he said belonged to a seal. On a more minute examination, however, it was found not to have belonged to a seal, but to an old dog, whose head it was evidently thought might, without any damage to the hunting, be handed over to the white magicians. This time it went worse with the counterfeitor than in the case of the ptarmigan bargain. For a couple of my comrades undertook to make the boy ashamed in the presence of the other Chukches, saying with a laugh "that he, a Chukchi, must have been very stupid to commit such a mistake," and it actually appeared as if the scoff had in this case taken effect.

The Chukches are commonly monogamous; it is only exceptionally that they have two wives, as was the case with Chepurin, who has been already mentioned. It appeared as if the wives were faithful to their husbands. It was only seldom that cases occurred in which women, either in jest or earnest, gave out that they wished a white man as a lover. The young women were modest, often very pretty, and evidently felt the same necessity of attracting attention by small coquettish artifices as Eve's daughters of European race. We may also understand their peculiar pronunciation of the language as an expression of feminine coquetry. For when they wish to be attractive they replace the man's *r*-sound with a soft *s*; thus, *korang* (reindeer) is pronounced by the women *kosang*, *tirkir* (the sun) *tiskis*, and so on.

The women work very hard. Not only the management of the children, the cooking, the melting of the ice, the putting the tent in order, the sewing, and other "woman's work," fall to their hand, but they receive the catch, in winter in the tent, in summer at the beach, cut it in pieces, help with the fishing, at least when it is in the neighbourhood of the tent, and carry out the exceedingly laborious tanning of the hides, and prepare



CHUKCHI BONE CARVINGS

- 1 Dog, natural size 2, 3 Hares, natural size 4 Woman carrying her child on her shoulders, two-thirds 5 Mollusc from the inland lakes (Branchiopus?), natural size. 6. Monster, natural size. 7 Fox, natural size 8. Animal with three heads, two-thirds. 9 Asterid, natural size. 10 Fish, natural size.

thread from sinews. In summer they collect green plants in the meadows and hill-slopes in the neighbourhood of the tents. They are therefore generally at home, and always busy. The men have for their part to procure for the family food from the animal kingdom by hunting and fishing. With this purpose in view they are often out on long excursions. In the tent the man is for the most part without occupation, sleeps, eats, gossips, chats with his children, and so on, if he does not pass the time in putting his hunting implements in order in a quite leisurely manner.

Within the family the most remarkable unanimity prevails, so that we never heard a hard word exchanged, either between man and wife, parents and children, or between the married pair who own the tent and the unmarried who occasionally live in it. The power of the woman appears to be very great. In making the more important bargains, even about weapons and hunting implements, she is, as a rule, consulted, and her advice is taken. A number of things which form women's tools she can barter away on her own responsibility, or in any other way employ as she pleases. When the man has by barter procured a piece of cloth, tobacco, sugar, or such like, he generally hands it over to his wife to keep.

The children are neither chastised nor scolded; they are, however, the best behaved I have ever seen. Their behaviour in the tent is equal to that of the best-brought-up European children in the drawing-room. They are not, perhaps, so wild as ours, but are addicted to games which closely resemble those common among us in the country. Playthings are also in use, for instance, dolls, bows, windmills with two sails, &c. If the parents get any delicacy they always give each of their children a bit, and there is never any quarrel as to the size of each child's portion. If a piece of sugar is given to one of the children in a crowd it goes from mouth to mouth round the whole company. In the same way the child offers its father and mother a taste of the bit of sugar or piece of bread it has got. Even in childhood the Chukches are exceedingly patient. A girl who fell down from the ship's stair, head foremost, and thus got so violent a

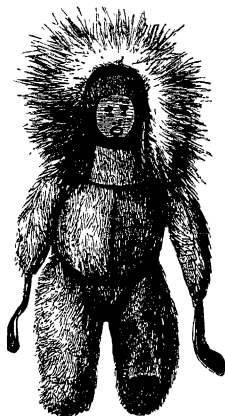
blow that she was almost deprived of hearing, scarcely uttered a cry. A boy, three or four years of age, much rolled up in furs, who fell into a ditch cut in the ice on the ship's deck, and in consequence of his inconvenient dress could not get up, lay quietly until he was observed and helped up by one of the crew.

The Chukches' most troublesome fault is a disposition to begging that is restrained by no feeling of self-respect. This is probably counterbalanced by their unbounded hospitality and great kindness to each other, and is, perhaps, often caused by actual necessity. But they thus became veritable torments, putting to a hard test the patience, not only of the scientific men and officers, but also of the crew. The good nature with which our sailors met their demands was above all praise.

There was never any trace of disagreement between the natives and us, and I have every reason to suppose that our wintering will long be held in grateful remembrance by them, especially as, in order not to spoil their seal-hunting, I strictly forbade all unnecessary interference with it.

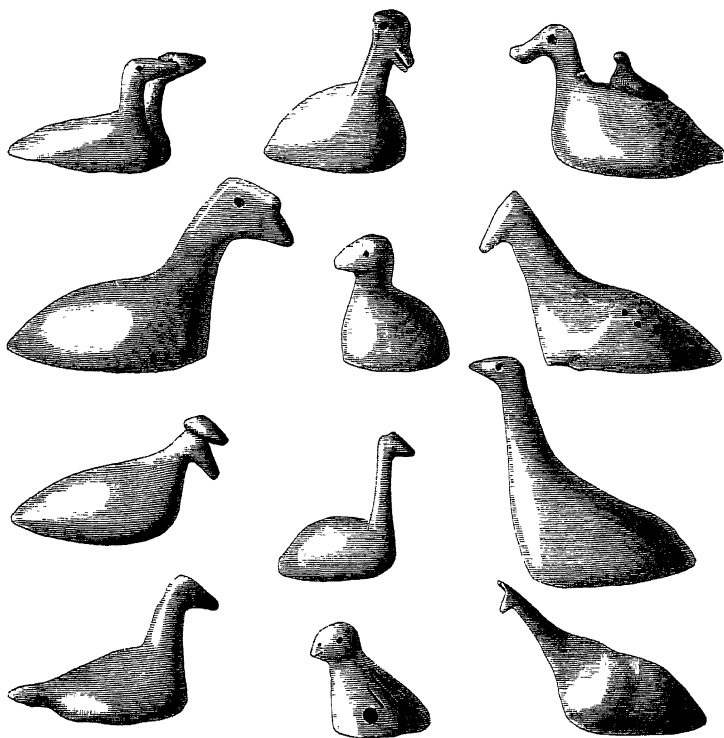
It is probably impossible for a Chukchi to take the place of a European workman. It has, however, happened that Chukches have gone with whalers to the Sandwich Islands, and have become serviceable seamen. During our wintering two young men got accustomed to come on board and there take a hand, in quite a leisurely way, at work of various kinds, as sawing wood, shovelling snow, getting ice on board, &c. In return they got food that had been left over, and thus, for the most part, maintained not only themselves, but also their families, during the time we remained in their neighbourhood.

If what I have here stated be compared with Sir EDWARD PARRY's masterly sketches of the Eskimo at Winter Island and



CHUKCHI DOLL
One-eighth of the natural size

Iglolik, and Dr. SIMPSON's of the Eskimo in North-western America, or with the numerous accounts we possess of the Eskimo in Danish Greenland, a great resemblance will be found



CHUKCHI BONE CARVINGS OF BIRDS

Size of the originals.

to exist between the natural disposition, mode of life, failings and good qualities of the Chukches, the savage Eskimo, and the Greenlanders. This resemblance is all the more striking, that the Chukchi and the Eskimo belong to different races, and speak

quite different languages, and that the former, to judge by old accounts of this people, did not, until the most recent generations, sink to the unwarlike, peace-loving, harmless, anarchic, and non-religious standpoint which they have now reached.

Even the present Chukches form, without doubt, a mixture of several races, formerly savage and warlike, who have been driven by foreign invaders from south to north, where they have adopted a common language, and on whom the food-conditions of the shore of the Polar Sea, the cold, snow, and darkness of the Arctic night, the pure, light atmosphere of the Polar summer, have impressed their ineffaceable stamp; a stamp which meets us with little variation, not only among the people now in question, but also—with the necessary allowance for the changes, not always favourable, caused by constant intercourse with Europeans—among the Lapps of Scandinavia and the Samoyeds of Russia.

It would be of great psychological interest to ascertain whether the change which has taken place in a peaceful direction is progress or decadence. Notwithstanding all the interest which the honesty, peaceableness, and innocent friendliness of the Arctic tribes have for us, it is my belief that the answer must be—*decadence*. For it strikes us that we see here the conversion of a savage, coarse, and cruel man into a being, nobler, indeed, but one in whom just those qualities which distinguish man from the lower animals, and to which at once the great deeds and the crimes of humanity have been due, have been more and more effaced, and who, if special protection or specially favourable circumstances be absent, will not be able to maintain the struggle for existence with new races that may seek to force their way into the country.

■

CHAPTER XI.

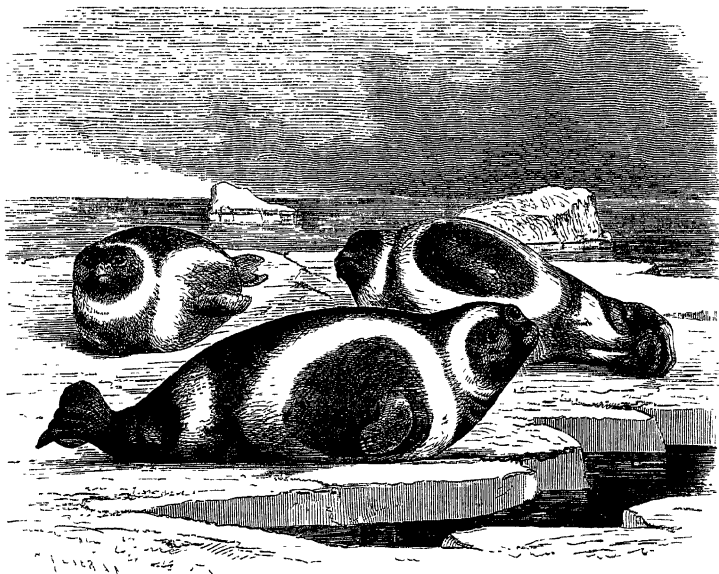
Passage through Behring's Straits—Arrival at Nunamo—Scarce species of seal—Rich vegetation—Passage to America—State of the ice—Port Clarence—The Eskimo—Return to Asia—Konyam Bay—Natural conditions there—The ice breaks up in the interior of Konyam Bay—St. Lawrence Island—Departure to Behring Island.

AFTER we had passed the easternmost promontory of Asia, the course was shaped first to St. Lawrence Bay, a not inconsiderable fiord, which indents the Chukchi peninsula a little south of the narrowest part of Behring's Straits.

Even the high mountains on the Asiatic shore were still wrapped in a thick mist, from which only single mountain-summits now and then appeared. Next the vessel large fields of drift-ice were visible, on which here and there flocks of a beautifully marked species of seal (*Histriophoca fasciata*, Zimm.) had settled. Between the pieces of ice sea-birds swarmed, mostly belonging to other species than those which are met with in the European Arctic seas. The ice was fortunately so broken up that the *Vega* could steam forward at full speed to the neighbourhood of St. Lawrence Bay, where the coast was surrounded by some more compact belts of ice, which however were broken through with ease. First, in the mouth of the fiord itself impenetrable ice was met with, completely blocking the splendid haven of St. Lawrence Bay. The *Vega* was, therefore, compelled to anchor in the open road off the village Nunamo. But even here extensive ice-fields, though thin and rotten, drifted about; and long, but narrow, belts of ice passed the vessel in so large masses that it was not advisable to

remain longer at the place. Our stay there was therefore confined to a few hours.

While we steamed forward cautiously in a dense fog in the neighbourhood of Cape Deshnev, twenty to thirty natives came rowing in a large skin boat to the vessel. Eager to make acquaintance with a tribe new to us, we received them with pleasure. But



SEAL FROM THE BEHRING SEA.

Histiophoca fasciata, Zimm.

when they climbed over the side we found that they were pure Chukches, some of them old acquaintances, who during winter had been guests on board the *Vega*. "Ankali" said they, with evident contempt, are first met with farther beyond St. Lawrence Bay. When we anchored next day at the mouth of this bay we were immediately, as usual, visited by a large number of natives, and

ourselves visited their tents on land. They still talked Chukchi with a limited mixture of foreign words, lived in tents of a construction differing somewhat from the Chukches', and appeared to have a somewhat different cast of countenance. They themselves would not allow that there was any racial difference between them and the old warrior and conqueror tribe on the north coast, but stated that the race about which we inquired were settled immediately to the south. Some days after we anchored in Konyam Bay ($64^{\circ} 49' \text{ N. L.}, 172^{\circ} 53' \text{ W. L.}$ from Greenwich). We found there only pure reindeer-owning Chukches; there was no coast population living by hunting and fishing. On the other hand, the inhabitants near our anchorage off St. Lawrence Island consisted of Eskimo and Namollo. It thus appears as if a great part of the Eskimo who inhabit the Asiatic side of Behring's Straits, had during recent times lost their own racial characteristics, and become fused with the Chukches. It appears to me to be on the whole more probable that the Eskimo have migrated from America to Asia, than that, as some authors have supposed, this tribe has entered America from the west by Behring's Straits or Wrangel Land.

The tent-village Nunamo, or, as Hooper writes, "Noonah-mone," does not lie low, like the Chukchi villages we had formerly seen, on the sea-shore, but pretty high up on a cape between the sea and a river which debouches immediately to the south-west of the village, and now during the snow-melting season was much flooded. At a short distance from the coast the land was occupied by a very high chain of mountains, which was split up into a number of summits and whose sides were formed of immense stone mounds distributed in terraces. Here a large number of marmots and lagomys had their haunt. The lagomys, a species of rodent that does not occur in Sweden, of the size of a large rat, is remarkable for the care with which in summer it collects great stores for the winter. The village consisted of ten tents built without order on the first high strand bank. The tents differed somewhat in construction from the common Chukchi tents, and as drift-wood appears to be met with on the beach only in limited quantity, whale-bones had been used on a very large scale in the frame of

the tent. In the absence of drift-wood, whale and seal bones drenched in train-oil are also used as fuel in cooking in the open air during summer.

Masses of black seal-flesh, and long, white, fluttering strings of inflated intestines, were hung up between the tents, and in their interior there were everywhere to be seen bloody pieces of flesh, prepared in a disgusting way or lying scattered about. A pleasant interruption was formed by the heaps of green willow branches which were placed at the entrance of nearly every tent, commonly surrounded by women and children, who ate the leaves with delight. At some places whole sacks of *Rhodiola* and various other plants had been collected for food during winter. As distinctive of the Chukches here it may be mentioned in the last place that they were abundantly provided with European household articles, among them *Remington guns*, and that none of them asked for spirits.

Most of the seals which were seen in the tents were the common *Phoca hispida*, but along with them we found several skins of *Histiophoca fasciata*, Zimm.

When we left Pitlekai, vegetation there was still far from having reached its full development, but at Nunamo the shore was gay with an exceedingly rich magnificence of colour. On an area of a few acres Dr. Kjellman collected here more than a hundred species of flowering plants, among which were a considerable number that he had not before seen on the Chukchi peninsula. At the rocky headlands there were still, however, considerable snow-drifts, and from the heights we could see that considerable masses of ice were still drifting along the Asiatic side of Behring's Straits. During an excursion to the top of one of the neighbouring mountains, Dr. Stuxberg found the corpse of a native laid out on a stone-setting of the form common among the Chukches. Alongside the dead man lay a broken percussion gun, spear, arrows, tinder-box, pipe, snow-shade, ice-sieve, and various other things which the departed was considered to be in want of in the part of the Elysian fields set apart for Chukches. The corpse had lain on the place at least since the preceding summer, but the pipe was one of the clay pipes that I had caused

to be distributed among the natives. It had thus been placed there long after the proper burial.

On the afternoon of the 21st July when all were assembled on board pleased and delighted with the results of the morning visit to land, I ordered the anchor to be weighed that the *Vega* might steam across to the American side of Behring's Straits. As in all the Polar Seas of the northern hemisphere, so also here, the eastern side of the Straits was ice-bestrewn, the western, on the other hand, clear of ice. The passage was at all events a rapid one, so that by the afternoon of the 21st July we were able to anchor in Port Clarence, an excellent haven south of the westernmost promontory of Asia, Cape Prince of Wales. *It was the first time the Vega anchored in a proper haven, since on the 18th August 1878 she left Actinia Haven on Taimur Island.* During the intermediate time she had been constantly anchored or moored in open roads without the least land shelter from sea, wind, and drift-ice. The vessel was, however, thanks to Captain Palander's judgment and thoughtfulness, and the ability of the officers and crew, still not only quite free from damage, but even as seaworthy as when she left the dock as Karlskrona, and we had still on board provisions for nearly a year, and about 4,000 cubic feet of coal.

Towards the sea Port Clarence is protected by a long low sandy reef, between the north end of which and the land there is a convenient and deep entrance. There a considerable river falls into the interior of the harbour, the mouth of which widens to a lake, which is separated from the outer harbour by a sandy neck of land. This lake also forms a good and spacious harbour, but its entrance is too shallow for vessels of any considerable draught. The river itself, on the contrary, is deep, and about eleven miles from its mouth flows through another lake, from the eastern shore of which rugged and shattered mountains rise to a height which I estimate at 2,600 to 3,200 feet; but it is quite possible that their height is twice as great, for in making such estimates one is liable to fall into error. South of the river and the harbour the land rises abruptly from the river bank, which is from thirty to sixty feet high.

On the north side, again, the bank is for the most part low, but farther into the interior the ground rises rapidly to rounded hills from 1,000 to 1,300 feet high. Only in the valleys and at other places where very large masses of snow had collected during the winter, were snow-drifts still to be seen. On the other hand, we saw no glaciers, though we might have expected to find them on the sides of the high mountains which bound the inner lake on the east. It was also clear that during the recent ages no widely extended ice-sheet was to be found here, for in the many excursions we made in different directions, among others up the river to the lake just mentioned, we saw nowhere any moraines, erratic blocks, striated rock-surfaces, or other traces of a past ice-age. Many signs, on the other hand, indicate that during a not very remote geological period glaciers covered considerable areas of the opposite Asiatic shore, and contributed to excavate the fiords there—Kolyuchin Bay, St. Lawrence Bay, Mechigme Bay, Konyam Bay, &c.

When we approached the American side we could see that the shore cliffs were formed of stratified rocks, which, however, only consisted of crystalline schists without any traces of animal or vegetable remains.

Immediately after the anchor fell we were visited by several very large skin boats and a large number of *kayaks*. The latter were larger than the Greenlanders', being commonly intended for two persons, who sat back to back in the middle of the craft. We even saw boats from which, when the two rowers had stepped out, a third person crept who had lain almost hermetically sealed in the interior of the *kayak*, stretched on the bottom without the possibility of moving his limbs, or saving himself if any accident should happen. It appeared to be specially common for children to accompany their elders in *kayak* voyages in this inconvenient way.

After the natives came on board a lively traffic commenced, whereby I acquired some arrow-points and stone fishing-hooks. Anxious to procure as abundant material as possible for instituting a comparison between the household articles of the Eskimo and the Chukches, I examined carefully the skin bags which the

natives had with them. In doing so I picked out one thing after the other, while they did not object to me making an inventory. One of them, however, showed great unwillingness to allow me to get to the bottom of the sack, but this just made me curious to ascertain what precious thing was concealed there. I was urgent, and went through the bag half with violence, until



ESKIMO FAMILY AT PORT CLARENCE.

(After a photograph by L. Palander.)

at last, in the bottom, I got a solution of the riddle—a loaded revolver. Several of the natives had also breechloaders. The oldest age with stone implements, and the most recent period with breechloaders, thus here touch each other.

Many natives were evidently migrating to more northerly hunting-grounds and fishing-places, perhaps also to the markets

and play booths, which Dr. John Simpson describes in his well-known paper on the West Eskimo.¹ Others had already pitched their summer tents on the banks of the inner harbour, or of the river before mentioned. On the other hand, there was found in the region only a small number of winter dwellings



ESKIMO AT PORT CLARENCE.
(After a photograph by L. Palander.)

abandoned during the warm season of the year. The population consisted, as has been said, of Eskimo. They did not understand a word of Chukchi. Among them, however, we found a Chukchi

¹ *Further Papers relative to the recent Arctic Expedition, etc.* Presented to both Houses of Parliament. London, 1855, p. 917.

woman, who stated that true Chukches were found also on the American side, north of Behring's Straits. Two of the men spoke a little English, one had even been at San Francisco, another at Honolulu. Many of their household articles reminded us of contact with American whalers, and justice demands the recognition of the fact that in opposition to what we commonly see stated, contact with men of civilised race appears to have been to the advantage and improvement of the savage in an economical and moral point of view. Most of them now lived in



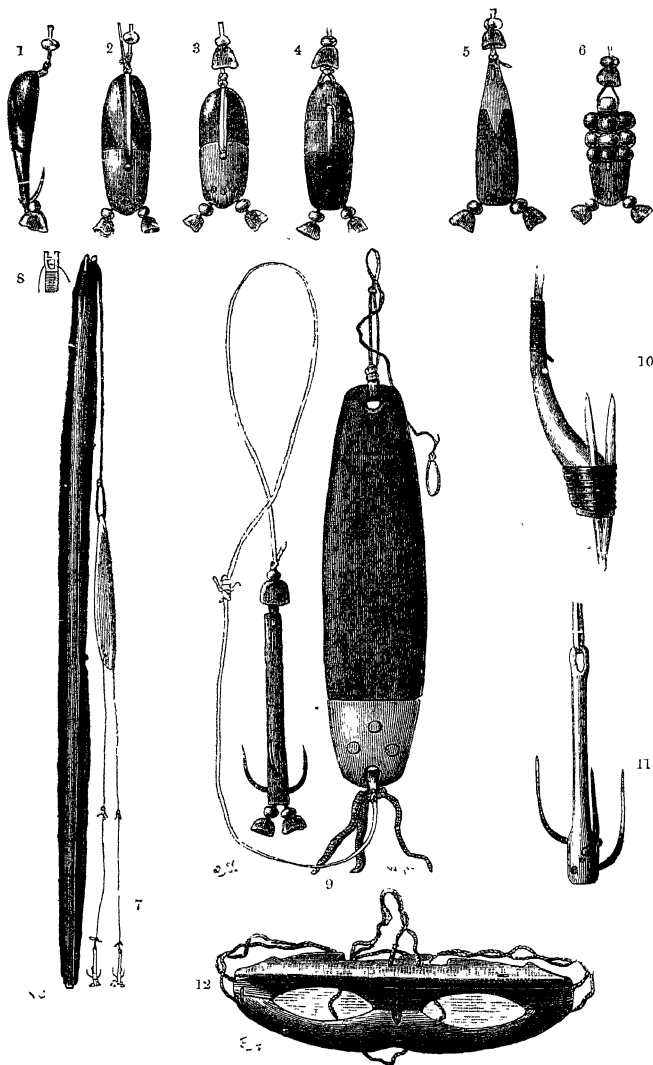
ESKIMO AT PORT CLARENCE.

(After photographs by L. Palander)

summer-tents of thin cotton cloth ; many wore European clothes, others were clad in-trousers of seal or reindeer-skin, and a light, soft, often beautifully ornamented *pesk* of marmot skin, over which in rainy weather was worn an overcoat made of pieces of gut sewn together. The arrangement of the hair resembled that of the Chukches. The women were tattooed with some lines on the chin. Many of the men wore small moustaches, some even a scanty beard, while others had attempted the American goatee. Most of them, but not all, had two holes a quarter of

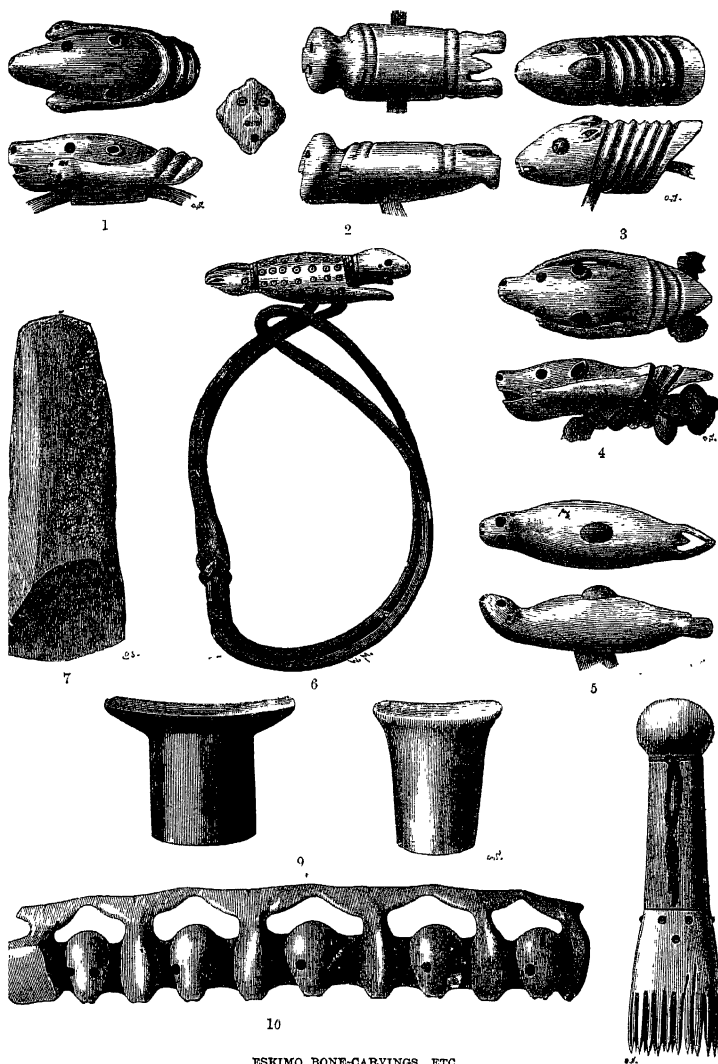
an inch in length, cut in the lips below the corners of the mouth. In these holes were worn large pieces of bone, glass, or stone (figure 9, page 343). But these ornaments were often removed, and then the edges of the large holes closed so much that the face was not greatly disfigured. Many had in addition a similar hole forward in the lip. It struck me, however, that this strange custom was about to disappear completely, or at least to be Europeanised by the exchange of holes in the ears for holes in the mouth. An almost full-grown young woman had a large blue glass bead hanging from the nose, in whose partition a hole had been made for its suspension, but she was very much embarrassed and hid her head in a fold of mama's *pesk*, when this piece of grandeur attracted general attention. All the women had long strings of beads in the ears. They wore bracelets of iron or copper, resembling those of the Chukches. The colour of the skin was not very dark, with perceptible redness on the cheeks, the hair black and tallow-like, the eyes small, brown, slightly oblique, the face flat, the nose small and depressed at the root. Most of the natives were of average height, appeared to be healthy and in good condition, and were marked neither by striking thinness nor corpulence. The feet and the hands were small.

A certain elegance and order prevailed in their small tents, the floor of which was covered with mats of plaited plants. In many places vessels formed of cocoa-nut shells were to be seen, brought thither, like some of the mats, by whalers from the South Sea Islands. For the most part their household and hunting implements, axes, knives, saws, breechloaders, revolvers, &c., were of American origin, but they still used or preserved in the lumber repositories of the tent, bows and arrows, bird-darts, bone boat-hooks, and various stone implements. The fishing implements especially were made with extraordinary skill of coloured sorts of bone or stone, glass beads, red pieces of the feet of certain swimming birds, &c. The different materials were bound together by twine made of whalebone in such a manner that they resembled large beetles, being intended for use in the same way as salmon-flies at home.



ESKIMO FISHING IMPLEMENTS, ETC.

1-6 Salmon hooks of stone of different colours, and bone in the form of beetles, one-half of the natural size 7. Fishing-rod, one-sixth. 8 End of rod. 9 Bone-sinker with tufts and fish-hook, one-half 10. Fish-hook with bone-points, one-half. 11. Fish-hook with iron-wire points, one-half. 12. Snow-spectacles, one-third.



ESKIMO BONE-CARVINGS, ETC.

1-5. Buttons to carrying-straps, representing heads of the Polar bear, seals, &c., carved in walrus ivory, one-half of the natural size. 6. Carrying-strap with a similar button, carved in the form of a seal, one-third. 7. Stone chisel, one-half. 8. Comb, one-third. 9. Buttons of bone, glass, or stone, to be placed in holes in the lips, natural size. 10. Ivory diadem, two-thirds.

Fire was got partly with steel, flint, and tinder, partly by means of the fire-drill. Many also used American matches. The bow of the fire-drill was often of ivory, richly ornamented with hunting figures of different kinds. Their tools were more elegant, better carved and more richly coloured with graphite and red ochre, than those of the Chukches; the people were better off and owned a larger number of skin-boats, both *kayaks* and *umiaks*. This undoubtedly depends on the sea being here covered with ice for a shorter time and the ice being thinner than on the Asiatic side, and the hunting accordingly being better. All the old accounts however agree in representing that in former times the Chukches were recognised as a great power by the other savage tribes in these regions, but all recent observations indicate that that time is now past. A certain respect for them, however, appears still to prevail among their neighbours.

The natives, after the first mistrust had disappeared, were friendly and accommodating, honourable in their dealings though given to begging and to much haggling in making a bargain. There appeared to be no chief among them; complete equality prevailed, and the position of the woman did not appear to be inferior to that of the man. The children were what we would call in Europe well brought up, though they got no bringing up at all. All were heathens. The liking for spirits appeared to be less strong than among the Chukches. We learn besides that all selling of spirits to savages is not only forbidden on the American side, but forbidden in such a way that the law is obeyed.

Among the articles I obtained may be mentioned beautiful bone etchings and carvings, and several arrow-points and other tools of a species of nephrite, which is so puzzlingly like the well-known nephrite from High Asia, that I am disposed to believe that it actually comes originally from that locality. In such a case the occurrence of nephrite at Behring's Straits is important, because it cannot be explained in any other way than either by supposing that the tribes living here have carried the mineral with them from their original home in High Asia, or that during the Stone Age of High Asia a like extended commercial

intercommunication took place between the wild races as now exists, or at least some decades ago existed, along the north parts of Asia and America.

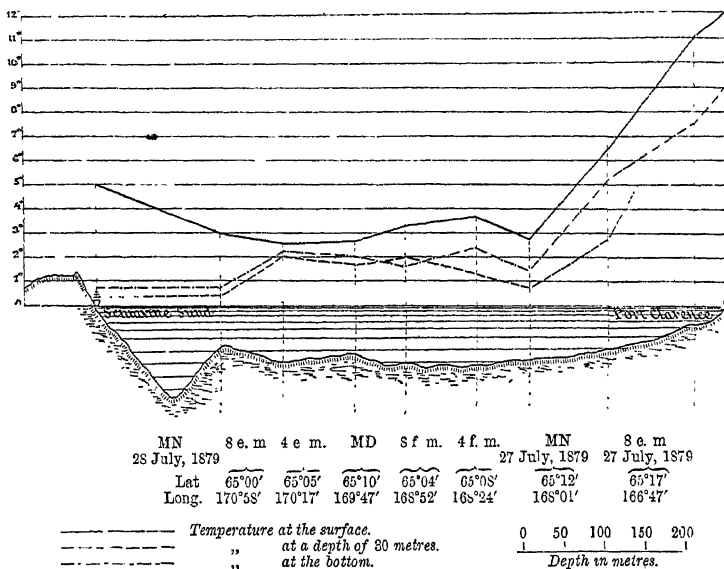
On the north side of the harbour we found an old European or American train-oil boiling establishment. In the neighbourhood of it were two Eskimo graves. The corpses had been laid on the ground fully clothed, without the protection of any coffin, but surrounded by a close fence consisting of a number of tent-poles driven crosswise into the ground. Alongside one of the corpses lay a *kayak* with oars, a loaded double-barrelled gun with locks at half-cock and caps on, various other weapons, clothes, tinder-box, snow-shoes, drinking-vessels, two masks carved in wood and smeared with blood, and strangely-shaped animal figures. Such were seen also in the tents. Bags of sealskin, intended to be inflated and fastened to harpoons as floats, were sometimes ornamented with small faces carved in wood.

As the west coast of Europe is washed by the Gulf Stream, there also runs along the Pacific coast of America a warm current, which gives the land a much milder climate than that which prevails on the neighbouring Asiatic side, where, as on the east coast of Greenland, there runs a cold northerly current. The limit of trees therefore in north-western America goes a good way *north of* Behring's Straits, while on the Chukchi Peninsula wood appears to be wholly wanting. Dr. Kjellman and Dr. Almquist therefore reaped here a rich botanical harvest. The harvest of the zoologists, on the other hand, was scanty. Notwithstanding the luxuriant vegetation land-invertebrates appear to occur in a much smaller number of species than in northern Norway. Among remarkable fishes may be mentioned the same black marsh-fish which we caught at Yinretlen. The avi-fauna was scanty for a high northern land, and of wild mammalia we saw only musk-rats. Even the dredgings in the harbour yielded, on account of the unfavourable nature of the bottom, only an inconsiderable number of animals and algæ.

On the 26th July, at three o'clock in the afternoon, we weighed anchor and steamed back in splendid weather and with for the most part a favourable wind to the shore of the Old World.

Lieutenant Bove constructed the diagram reproduced below, which is based on the soundings and other observations made during the passage, from which we see how shallow is the sound which in the northernmost part of the Pacific separates the Old World from the New. An elevation of the land less than that which has taken place since the glacial period at the well-known

DIAGRAM,
Showing the Temperature and Depth of the water at Behring's Straits between Port Clarence
and Senjavin Sound.
By G. BOVE.



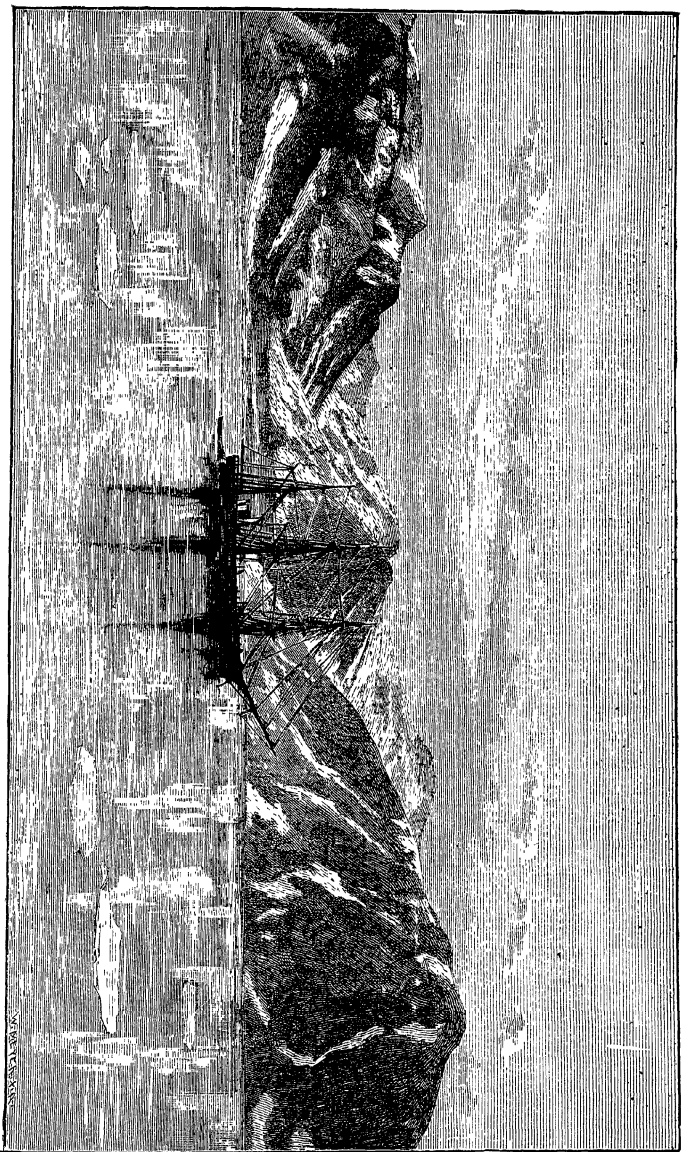
Chapel Hills at Uddevalla would evidently be sufficient to unite the two worlds with each other by a broad bridge, and a corresponding depression would have been enough to separate them if, as is probable, they were at one time continuous. The diagram shows besides that the deepest channel is quite close to the coast of the Chukchi Peninsula, and that that Channel

contains a mass of cold water, which is separated by a ridge from the warmer water on the American side.

Several small fiords cut into the south-east portion of the Chukchi Peninsula, which consists of stratified granitic rocks, and in the offing two large and several small rocky islands form an archipelago, separated from the mainland by the deep Senjavin Sound. The *Vega* anchored here on the forenoon of the 28th July, but not, as was at first intended, in Glasenapp Harbour, because it was still occupied by unbroken ice, but in the mouth of the most northerly of the fiords, Konyam Bay. The region appears to have been at one time inhabited by a rather dense population. Now there lived at the bay where we had anchored only three reindeer-Chukchi families, and the neighbouring islands must at the time have been uninhabited, or perhaps the arrival of the *Vega* may not have been observed, for no natives came on board, which otherwise would probably have been the case.

The shore at the south-east part of Konyam Bay, in which the *Vega* now lay at anchor for a couple of days, consists of a rather desolate bog, in which a large number of cranes were breeding. Farther into the country several mountain summits rise to a height of nearly 2,000 feet. The collections of the zoologists and botanists on this shore were very scanty, but on the north side of the bay, to which excursions were made with the steam-launch, grassy slopes were met with, with pretty high bushy thickets and a great variety of flowers, which enriched Dr. Kjellman's collection of the higher plants from the north coast of Asia with about seventy species. Here were found too the first land mollusca (*Succinea*, *Limax*, *Helix*, *Pupa*, &c.) on the Chukchi Peninsula. We also visited the dwellings of the reindeer-Chukchi families. They resembled the Chukchi tents we had seen before, and the mode of life of the inhabitants differed little from that of the coast-Chukches, with whom we passed the winter.

The mountains in the neighbourhood of Konyam Bay were high and split up into pointed summits with deep valleys still partly filled with snow. No glaciers appear to exist there at present. Probably however the fiords here and the sounds, like



KONYAK BAY.

(After a photograph by L. Palander)

St. Lawrence Bay, Kolyuchin Bay, and probably all the other deeper bays on the coast of the Chukchi Peninsula, have been excavated by former glaciers. It may perhaps be uncertain whether a true inland-ice covered the whole country; it is certain that the ice-cap did not extend over the plains of Siberia, where it can be proved that no Ice Age in a Scandinavian sense ever existed, and where the state of the land from the Jurassic period onwards was indeed subjected to some changes, but to none of the thoroughgoing mundane revolutions which in former times geologists loved to depict in so bright colours. At least the direction of the rivers appears to have been unchanged since then. Perhaps even the difference between the Siberia where Chikanovski's *Ginko* woods grew and the mammoth roamed about, and that where now at a limited depth under the surface constantly frozen ground is to be met with, depends merely on the isothermal lines having sunk slightly towards the equator.

The neighbourhood of Konyam Bay consists of crystalline rocks, granite poor in mica, and mica-schist lowermost, and then grey non-fossiliferous carbonate of lime, and last of all magnesian schists, porphyry, and quartzites. On the summits of the hills the granite has a rough trachytic appearance, but does not pass into true trachyte. Here however we are already in the neighbourhood of the volcanic *foci* of Kamchatka, which for instance is shown by the hot spring, which Hooper discovered not far from the coast during a sledge journey towards Behring's Straits.

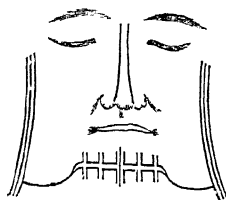
The interior of Konyam Bay was during our stay there still covered by an unbroken sheet of ice. This broke up on the afternoon of the 30th July, and had almost, rotten as it was, suddenly brought the voyage of the *Vega* to a termination by pressing her ashore. Fortunately the danger was observed in time. Steam was got up, the anchor weighed, and the vessel removed to the open part of the fiord. The course was now shaped for the north-west point of St. Lawrence Island. A little off Senjavin Sound we saw drift-ice for the last time. On the whole the quantity of ice which drifts down through Behring's Straits into the Pacific is not very great, and most of that which

is met with in summer on the Asiatic side of the Behring Sea, is evidently formed in fiords and bays along the coast. South of Behring's Straits accordingly I saw not a single iceberg nor any large block of glacier-ice, but only even and very rotten fields of bay-ice.

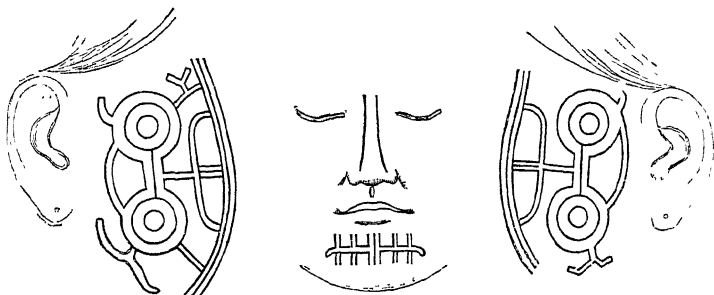
The *Vega* was anchored on the 31st July in an open bay on the north-western side of St. Lawrence Island. This island, called by the natives Enguæ, is the largest one between the Aleutian Islands and Behring's Straits. It lies nearer Asia than America, but is considered to belong to the latter, for which reason it was handed over along with the Alaska Territory by Russia to the United States. The island is inhabited by a few Eskimo families, who have commercial relations with their Chukchi neighbours on the Russian side, and therefore have adopted some words from their language. Their dress also resembles that of the Chukches, with the exception that, wanting reindeer-skin, they use *pesks* made of the skins of birds and marmots. Like the Chukches and Eskimo they use overcoats of pieces of seal-gut sewed together. On St. Lawrence Island their dress is much ornamented, chiefly with tufts of feathers of the sea-fowl that breed in innumerable flocks on the island. It even appears that gut clothes are made here for sale to other tribes; otherwise it would be difficult to explain how Kotzebue's sailors could in half an hour purchase at a single encampment 200 coats of this kind. At the time of our visit all the natives went bareheaded, the men with their black tallow-like hair clipped to the root, with the exception of the common small border above the forehead. The women wore their hair plaited and adorned with beads, and were much tattooed, partly after very intricate patterns, as is shown by the accompanying woodcuts. Like the children they mostly went barefooted and barelegged. They were well grown, and many had passable looks, but all were merciless beggars.

The summer-tents were irregular, but pretty clean and light huts of gut, stretched on a frame of drift-wood and whale-bones. The winter dwellings were now abandoned. They appeared to consist of holes in the earth, which were covered above, with the

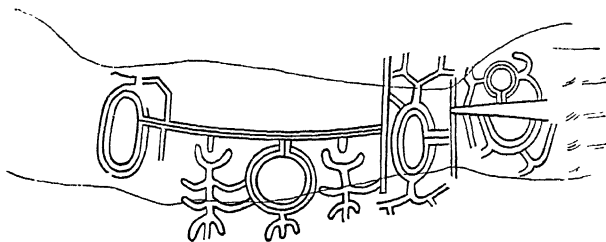
exception of a square opening, with drift-wood and turf. During winter a sealskin tent was probably stretched over this opening,



1



2



3

TATTOOING PATTERNS, FROM ST. LAWRENCE ISLAND.

1, 2 Face-tattooing 3. Arm-tattooing

(After drawings by A. Stuxberg)

but it was removed for the time, probably to permit the summer heat to penetrate into the hole and melt the ice, which had collected during winter on its walls.

North-east of the anchorage the shore was formed of low hills rising with a steep slope from the sea. Here and there ruinlike cliffs projected from the hills, resembling those we saw on the coast of Chukchi Land. But the rock here consisted of the same sort of granite which formed the lowermost stratum at Konyam Bay. It was principally at the foot of these slopes that the natives erected their dwellings. South-west of the anchorage commenced a very extensive plain, which towards the interior of the island was marshy, but along the coast formed a firm, even,



TATTOOED WOMAN, FROM ST. LAWRENCE ISLAND.

(After a drawing by A. Stuxberg.)

grassy meadow exceedingly rich in flowers. It was gay with the large sunflower-like *Arnica Pseudo-Arnica*, and another species of *Senecio* (*Senecio frigidus*); the *Oxytropis nigrescens*, close-tufted and rich in flowers, not stunted here as in Chukchi Land; several species of *Pedicularis* in their fullest bloom (*P. sudetica*, *P. Langsdorffii*, *P. Oederi* and *P. capitata*); the stately snow auricula (*Primula nivalis*), and the pretty *Primula borealis*. As characteristic of the vegetation at this place may also be mentioned several ranunculi, an anemone (*Anemone narcissiflora*), a species

of monkshood with flowers few indeed, but so much the larger on that account, large tufts of *Silene acaulis* and *Alsine macrocarpa*, studded with flowers; several Saxifrages, two *Claytoniæ*, the *Cl. acutifolia*, important as a food-plant in the housekeeping of the Chukches, and the tender *Cl. sarmentosa* with its delicate, slightly rose-coloured flowers, and, where the ground was stony, long but yet flowerless, slightly green tendrils of the favourite plant of our homeland, the *Linnaea borealis*. Dr. Kjellman thus reaped a rich harvest of higher plants; and a fine collection of land and marine animals, lichens and algæ, was also made here. The ground consisted of sand in which lay large granite blocks, which we in Sweden would call erratic. They appeared however not to have been transported hither, but to be lying *in situ*, having along with the sand probably arisen through the disintegration of the rocks.

In the sea we found not a few algæ and a true littoral invertebrate-fauna, poor in species indeed, something which is completely absent in the Polar seas proper. As I walked along the coast I saw five pretty large greyish-brown seals sunning themselves on stones a short distance from land. They belonged to a species which I had never seen in the Polar seas.

On the 2nd of August at three o'clock in the afternoon we resumed our voyage. Unfavourable winds delayed our passage longer than I had calculated on, and Commander's Islands were not reached till the 14th August, when the *Vega* anchored in a very indifferent harbour completely open to the west, north-west, and south, lying on the west side of Behring Island, between the main island and a small island lying off it.

CHAPTER XII.

The position of Behring Island—Its inhabitants—The discovery of the island by Behring—Steller—The former and present Fauna on the island. foxes, sea-otters, sea-cows, sea-lions, and sea-bears—Collection of bones of the Rhytina—Visit to a “rookery”—Voyage to Yokohama—Lightning-stroke.

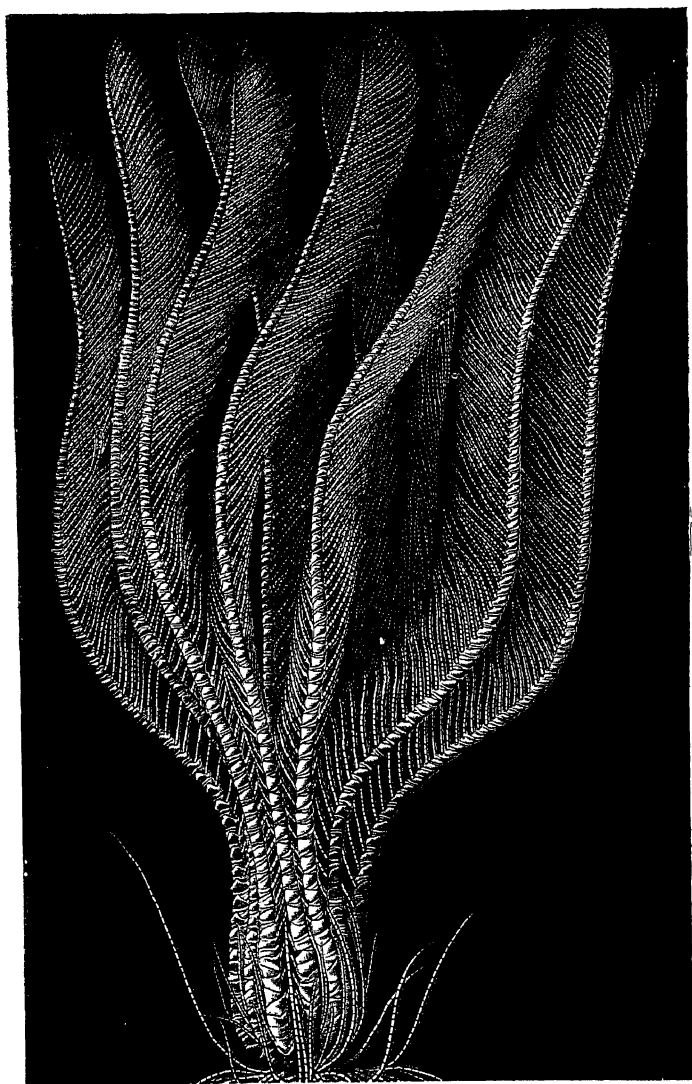
BEHRING ISLAND is situated between $54^{\circ} 40'$ and $55^{\circ} 25'$ N. L. and $165^{\circ} 40'$ and $166^{\circ} 40'$ E. L. from Greenwich. It is the westernmost and nearest to Kamchatka of the islands in the long chain formed by volcanic action, which bounds the Behring Sea on the south between 51° and 56° N. L. Together with the neighbouring Copper Island and some small islands and rocks lying round about, it forms a peculiar group of islands separated from the Aleutian Islands proper, named, after the rank of the great seafarer (Behring) who perished here, Commander's or Commandirski Islands. They belong not to America but to Asia, and are Russian territory. Notwithstanding this the American Alaska Company has acquired the right of hunting there, and maintains on the main islands two not inconsiderable commercial stations, which supply the inhabitants, several hundreds in number, with provisions and manufactured goods, the company buying from them in return furs, principally the skin of an eared seal (the sea-cat or sea-bear), of which from 20,000 to 50,000¹ are killed yearly

¹ According to a communication made to me by Mr. Henry W. Elliot, who, in order to study the fur-bearing seals in the North Behring Sea, lived a considerable time at the Seal Islands (Pribyllov's Islands, &c.) on the American

but was afterwards bestrewed with even, thin pieces of drift-ice, which were not forced up on each other, and thus had not been exposed in winter to any ice-pressure. This ice did not cause any inconvenience to the navigation, but at the same time all was wrapt in a very close mist, which soon compelled us to anchor near the shore in a little bay. I endeavoured without success to determine the position of the place by astronomical observations. Along the shore there still remained nearly everywhere a pretty high snow and ice-foot, which in the fog presented the appearance of immense glaciers. The land besides was free of ice. In respect of its geological formation and its animals and plants it resembled completely the island I have just described. But the sea-water here was clear and salt, and the dredging therefore yielded to Dr. Kjellman some large algæ, and to Dr. Stuxberg a large number of marine evertibrates.

When the fog lightened, we immediately steamed on, but we had scarcely got to sea before we were again wrapped in so close a fog that we were compelled to lie-to for the night beside a large piece of drift-ice. The hempen tangles were used, and brought up a very abundant yield of large, beautiful animal forms, a large number of asterids, *Astrophyton*, *Antedon*, &c. We also came here upon an exceedingly remarkable, and to me still a very enigmatical find.

For several years back I have been zealous in the examination of all substances of the nature of dust which fall to the surface of the earth with rain or snow, and I have proved that a portion of them is of cosmic origin. This inconsiderable fall of dust is thus of immense importance for the history of the development of our globe, and we regard it, besides, with the intense interest which we inevitably cherish for all that brings us into actual contact with the material world beyond our globe. The inhabited regions of the earth, however, are not favourable for such investigations, as the particles of cosmic dust falling there in very limited quantity can only with difficulty be distinguished from the dust of civilization, arising from human dwellings, from the refuse of industry, from furnaces and chimneys of steam-engines. The case is quite different on the snow and ice-fields of the High

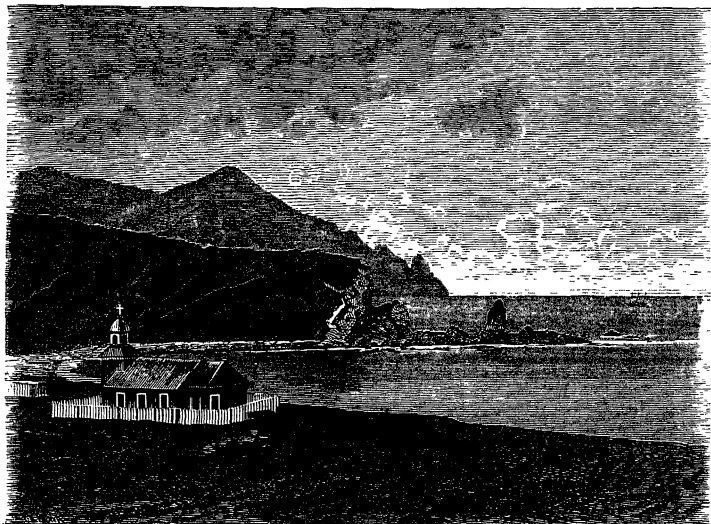


HAIRSTAR FROM THE TAIMUR COAST.

Antedon Eschrichtii, J. MÜLLER Three fifths of the natural size.

involuntarily passed the time from the middle of November 1741, to the end of August 1742.¹

It was the desire to procure for our museums the skins or skeletons of the many remarkable mammalia occurring here, also to compare the present state of the island which for nearly a century and a half has been exposed to the unsparing thirst of



THE "COLONY" ON COPPER ISLAND.

(After a photograph.)

man for sport and plunder, with Steller's spirited and picturesque description, which led me to include a visit to the island in the

¹ Original accounts of the wintering on Behring Island are to be found in Müller's *Sammlung Russischer Geschichte*, St. Petersburg, 1758, iii. pp. 228-238 and 242-268; (Steller's) *Topographische und physikalische Beschreibung der Beringsinsel* (Pallas' *Neue Nordische Beyträge*, St. Petersburg and Leipzig, 1781-83, ii. p. 225); G. W. Steller's *Tagebuch seiner Seereise aus dem Petropauls Hafen . . . und seiner Begebenheiten auf der Rückreise*, (Pallas' *Neueste Nordische Beyträge*, St. Petersburg and Leipzig, 1793-96, i. p. 130; ii. p. 1).

plan of the expedition. The accounts I got at Behring Island from the American newspapers of the anxiety which our wintering had caused in Europe led me indeed to make our stay there shorter than I at first intended. Our harvest of collections and observations was at all events extraordinarily abundant.

The immense quantity of valuable furs brought home by the survivors of Behring's unfortunate third voyage affected the fur-dealers, Cossacks, and hunters of Siberia, much in the same way as the rumour about Eldorado did the Spanish discoverers of middle and southern America. Numerous expeditions were fitted out to the new land rich in furs, where extensive territories previously unknown were made tributary to the Czar of Russia. Most of these expeditions landed on Behring Island during the voyage out and home, and in a short time wrought a complete change in the fauna of the island. Thanks to Steller's spirited sketch of the animal life he observed there, we have an opportunity of forming an idea of the alteration in the fauna which man produces in a land in which he settles. Arctic foxes were found in incredible numbers on the island during the wintering of the Behring expedition. They not only ate up everything that was at all eatable that was left in the open air, but forced their way as well by day as by night into the houses and carried off all that they could, even such things as were of no use whatever to them, as knives, sticks, sacks, shoes and stockings. Since then thousands and thousands of foxes have been killed on Behring Island by the fur-hunters. Now they are so scarce that during our stay there we did not see one. Those that still survive, moreover, as the Europeans settled on the island informed me, do not wear the precious dark blue dress formerly common, but the white, which is of little value. On the neighbouring Copper Island, however, there are still dark blue foxes in pretty large numbers.

Nine hundred sea-otters were killed here by Steller and his companions in 1741-2. The following quotation is taken from Steller's description of this animal which is now so shy at the sight of man :—

“With respect to playfulness it surpasses every other animal that lives either in the sea or on the land. When it comes up



NATIVES OF BHRING ISLAND
(After a photograph)

1874

out of the sea it shakes the water from its fur, and dresses it as a cat its head with its fore-paws, stretches its body, arranges its hair, throws its head this way and that, contemplating itself and its beautiful fur with evident satisfaction. The animal is so much taken up with this dressing of itself, that while thus employed it may easily be approached and killed. If one strikes a sea-otter twenty times across the back, it bears it patiently, but if its large beautiful tail be struck once it turns its head to its pursuer, as if to offer it as a mark for his club in place of the tail. If it eludes an attack it makes the most laughable gestures to the hunter. It looks at him, placing one foot above the head as if to protect it from the sunlight, throws itself on its back, and turning to its enemy as if in scorn scratches itself on the belly and thighs. The male and female are much attached to each other, embrace and kiss each other like men. The female is also very fond of its young. When attacked she never leaves it in the lurch, and when danger is not near she plays with it in a thousand ways, almost like a child-loving mother with her young ones, throws it sometimes up in the air and catches it with her fore-feet like a ball, swims about with it in her bosom, throws it away now and then to let it exercise itself in the art of swimming, but takes it to herself with kisses and caresses when it is tired."

According to recent researches the *sea-otter*, sea-beaver or Kamchatka-beaver (*Enhydra lutris*, Lin.) is a species neither of the otter nor the beaver, but belongs to a peculiar genus, allied to a certain extent to the walrus. Even this animal, unsurpassed in the beauty of its skin, has been long since driven away not only from Behring Island but also from most of the hunting-grounds where it was commonly killed by thousands, and if an effective law be not soon put in force to keep the hunting within bounds, and check the war of extermination which greed now carries on against it, no longer with clubs and darts but with powder and breechloaders, the sea-otter will meet the same fate which has already befallen Steller's sea-cow. Of the sea-lion (*Eumetopias Stelleri*, Lesson), which in Steller's time was found in abundance on the shore cliffs of Behring Island, there are now only a few individuals found along with the sea-bears (*Otaria ursina*, Lin.); and finally, the most remarkable of all the old

mammalia of Behring Island, the great sea-cow, is completely extinct.

Steller's sea-cow (*Rhytina Stelleri*, Cuvier), held in a way the place of the cloven-footed animals among the marine mammalia. The sea-cow was of a dark-brown colour, sometimes varied with white spots or streaks. The thick leathery skin was covered with hair which grew together so as to form an exterior skin, which was full of vermin, and resembled the bark of an old oak. The full grown animal was from twenty-eight to thirty-five English feet in length, and weighed about sixty-seven cwt. The head was small in proportion to the large thick body, the neck short, the body diminishing rapidly behind. The short fore-leg terminated abruptly without fingers or nails, but was overgrown with a number of short thickly placed brush-hairs; the hind-leg was replaced by a tail-fin resembling a whale's. The animal wanted teeth, but was instead provided with two masticating plates, one in the gum the other in the under jaw. The udders of the female, which abounded in milk, were placed between the fore-limbs. The flesh and milk resembled those of horned cattle, indeed in Steller's opinion surpassed them. The sea-cows were almost constantly employed in pasturing on the sea-weed which grew luxuriantly on the coast, moving the head and neck while so doing much in the same way as an ox. While they pastured they showed great voracity, and did not allow themselves to be disturbed in the least by the presence of man. One might even touch them without their being frightened or disturbed. They entertained great attachment to each other, and when one was harpooned the others made incredible attempts to rescue it.

When Steller came to Behring Island, the sea-cows pastured along the shore, collected like cattle into herds. The shipwrecked men, for want of suitable implements, did not hunt them at first. It was only after a thoughtless love of slaughter had driven all other animals suitable for food far from their winter quarters that the men began to devise means to catch the sea-cow also. They endeavoured to harpoon the animal with a strong iron hook made for the purpose, and then drag it to land. The first attempt was made on the 1st June (= 21st May), 1742, but it was

unsuccessful. It was not until after many renewed attempts that they at last succeeded in killing and catching a number of animals, and dragging them at high water so near land that they were dry at ebb. They were so heavy that forty men were required to do this ; we may conclude from these particulars that the number of sea cows killed during the first wintering on Behring Island was not very large.

It is remarkable that the sea-cow is so mentioned by later travellers only in passing, that this large animal, still hunted by Europeans in the time of Linnæus, would scarcely have been registered in the system of the naturalist if Steller had not wintered on Behring Island. What Krascheninnikov says of the sea-cow is wholly borrowed from Steller, and in the same way *nearly all* the statements of later naturalists as to its occurrence and mode of life. That this is actually the case is shown by what is said of the sea-cow in the only original account of the first hunting voyages of the Russians to the Aleutian Islands, which was published at Hamburg and Leipzig in 1776 with the title, *Neue Nachrichten von denen neuentdeckten Inseln in der See zwischen Asien und Amerika, aus mitgetheilten Urkunden und Auszügen verfasst von J. L. S * ** (Scherer). In this book the sea-cow is mentioned as having been caught in numbers under the years 1754, 1757, 1758, 1762 ; but its name only occurs without any description whatever.

In 1772 DMITRI BRAGIN wintered on Behring Island during a hunting voyage. In a journal kept at the request of Pallas, the large marine animals occurring on the island are enumerated, but not a word is said about the sea-cow (PALLAS, *Neue nordische Beyträge*, ii. p. 310).

SCHELECHOV passed the winter 1783-84 on Behring Island, but during the whole time he only succeeded in killing some white foxes, and in the narrative of the voyage there is not a word about the sea-cow (GRIGORI SCHELECHOV *russischen Kaufmanns erste und zweite Reise*, &c., St. Petersburg. 1793).

Some further accounts of the sea-cow have been obtained through the mining engineer PET. JAKOVLEV, who visited Commander's Islands in 1755. In 1867 PEKARSKI published

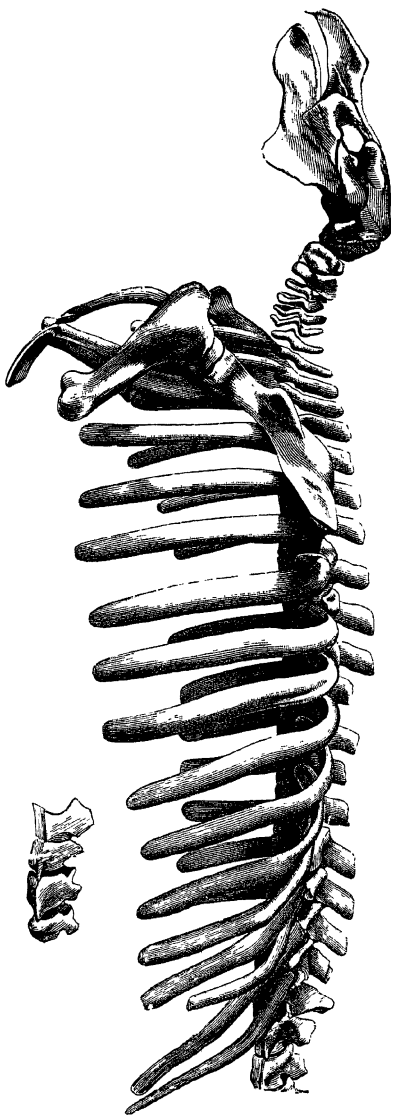
in the *Memoirs* of the Petersburg Academy some extracts from Jakovlev's journal, from which it appears that the sea-cow already in his time was driven away from Copper Island.

In his account of Behring's voyage (1785-94) published in 1802, Sauer says, p. 181: "Sea-cows were very common on Kamchatka and the Aleutian Islands,¹ when they were first discovered, but the last was killed on Behring Island in 1768, and none has been seen since then."

On the ground of the writings of which I have given an account above, and of various pieces of information collected during this century from the Russian authorities in the region, by the skilful conservator WOSNESSENSKI, the academicians von Baer and Brandt² came to the conclusion that the sea-cow had scarcely been seen by Europeans before the 19th (= 8th) November, 1741, when Steller, the day after his landing on Behring Island, for the first time saw some strange animals pasturing with their heads under water on the shores of the island; and that the animal twenty-seven years afterwards, or in 1768, was completely exterminated. The latter statement however is undoubtedly incorrect; for, in the course of the many inquiries I made of the natives, I obtained distinct information that living sea-cows had been seen much later. A half-breed (the offspring of a Russian and an Aleutian), who was sixty-seven years of age, of intelligent appearance and in the full possession of his mental faculties, stated "that his father died in 1847 at the age of eighty-eight. He had come from Volhynia, his native place, to Behring Island at the age of eighteen, accordingly in 1777. The two or three first years of his stay there, *i.e.* till 1779 or 1780, sea-cows were still being killed as they pastured on sea-weed. The heart only was eaten, and the hide used for *baydars*. In consequence of its

¹ The sea-cow does not appear to have ever occurred on the Aleutian Islands. It is probable that in former times the sea-cow was to be met with as far south as the north part of Japan. Some scientific men have even conjectured that the animal may have occurred north of Behring's Straits. This however is improbable. Among the mass of subfossil bones of marine animals which we examined at Pitlekai the bones of the sea-cow did not appear to be present.

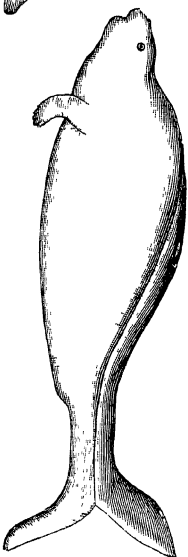
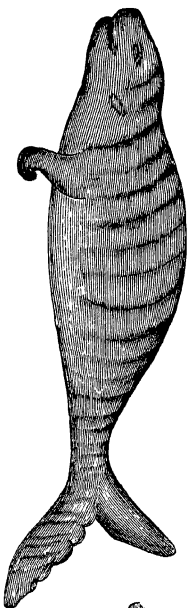
² Von Baer's and Brandt's numerous writings on the sea-cow are to be found in the publications of the St. Petersburg Academy.



SKELETON OF RHYTINA, SHOWN AT THE "VEGA" EXHIBITION AT THE ROYAL PALACE, STOCKHOLM
(After a photograph)

1

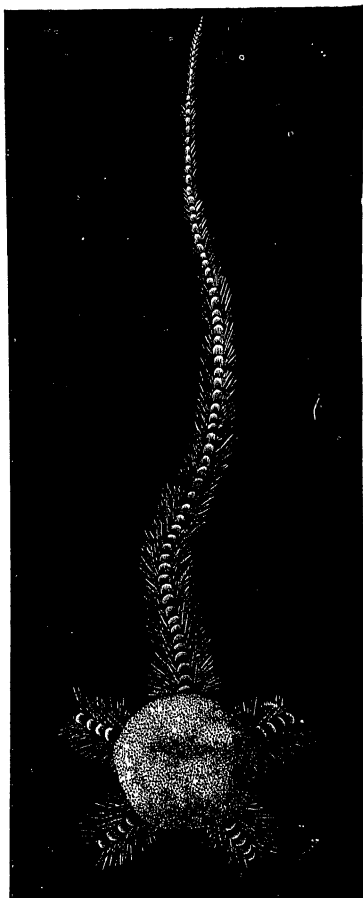
2



ORIGINAL DRAWINGS OF THE RHYTINA.
1 Drawing in an old map of the Behring Sea, found by Müllendorff (*Sibir. Reise*, iv 2 p 839). 2 Sketch by Steller, given to Pallas (*Pallas, Icones ad zoographiam Rossio-Asiaticam*, Fasc. II).

position of this important point I remained there until the 20th August at noon. The *Lena* was ordered to steam out to dredge during this time. Eight minutes north of the bay, where we lay at anchor, heavy and very close ice was met with. There the depth of the sea increased rapidly. Animal life at the sea-bottom was very abundant, among other things in large asterids and ophiurids.

According to the plan of the voyage I now wished to steam from this point right eastwards towards the New Siberian Islands in order to see if we should fall in with land on the way. On the 20th and 21st we went forward in this direction among scattered drift-ice, which was heavier and less broken up than that which we had met with on the other side of Taimur Land, but without meeting with any serious obstacles. We fell in also with some very large ice-floes, but not with any icebergs. We were besides again attended by



OPHIURID FROM THE SEA NORTH OF CAPE
CHELYUSKIN.

Ophiacantha bidentata, RETZ.

One and one-third of the natural size.

so dense a mist that we could only see ice-fields and pieces of ice in the immediate neighbourhood of the vessel. Besides species of Lestris and kittiwakes we now also saw looms, birds that are almost wanting in the Kara Sea. Johannesen was of opinion that the presence of these birds showed that the sea is not completely frozen over in winter, because it is not probable that the loom in autumn and spring would fly across the frozen Kara Sea to seek in this distant region its food and its breeding-haunts.

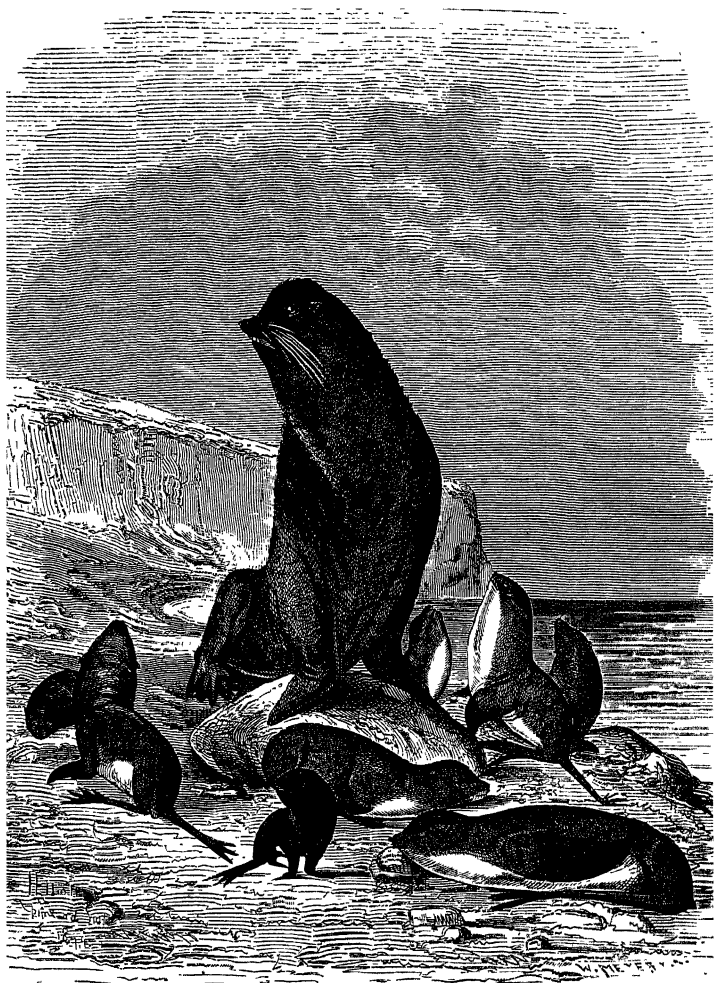
The night before the 22nd we steamed through pretty close ice. The whole day so thick a fog still prevailed that we could not see the extent of the ice-fields in the neighbourhood of the vessel. Towards noon we were, therefore, compelled to take a more southerly course. When we found that we could not advance in this direction, we lay-to at a large ice-floe, waiting for clear weather, until in the afternoon the fog again lightened somewhat, so that we could continue our voyage. But it was not long before the fog again became so thick that, as the sailors say, you could cut it with a knife. There was now evidently a risk that the *Vega*, while thus continuing to "box the compass" in the ice-labyrinth, in which we had entangled ourselves, would meet with the same fate that befell the *Tegetthoff*. In order to avoid this, it became necessary to abandon our attempt to sail from Cape Chelyuskin straight to the New Siberian Islands, and to endeavour to reach as soon as possible the open water at the coast.

When it cleared on the morning of the 23rd, we therefore began again to steam forward among the fields of drift-ice, but now not with the intention of advancing in a given direction, but only of getting to open water. The ice-fields we now met with were very much broken up, which was an indication that we could not be very far from the edge of the pack. But notwithstanding this, all our attempts to find penetrable ice in an easterly, westerly, or southerly direction were unsuccessful. We had thus to search in a northerly direction for the opening by which we had sailed in. This was all the more unpleasant that the wind had changed to a pretty fresh N.W. breeze, on which account, with the *Vega's* weak steam-power, we could make way only slowly. It was not

roubles for every animal killed, an exclusive right to the hunting, which was accordingly arranged in a more business-like way. At certain times of the year the killing of the sea-bear is wholly prohibited. The number of the animals to be killed is settled beforehand, quite in the same way as the farmer at the time of killing in autumn is wont to do with his herd of cattle. Females and young are only killed exceptionally. Even the married males, or more correctly the males that can get themselves a harem and can defend it, commonly escape being killed, if not for any other reason, because the skin is too often torn and tattered and the hair pulled out. It is thus the bachelors that have to yield up their skins.

That a wild animal may be slaughtered in so orderly a way depends on its peculiar mode of life.¹ For the sea-bears are found year after year during summer at certain points projecting into the sea (rookeries), where, collected in hundreds of thousands, they pass several months without the least food. The males (oxen) come first to the place, most of them in the month of May or at the beginning of June. The most violent combats, often with a deadly issue for one of the parties, now arise regarding the space of about a hundred square feet, which each seal-ox considers necessary for its home. The strongest and most successful in fight retain the best places near the shore; the weaker have to crawl farther up on land, where the chances of getting a sufficient number of spouses are not particularly great. The fighting goes on with many feigned attacks and parades. At first the contest concerns the proprietorship of the soil. The attacked therefore never follows its opponent beyond the area it has once taken up, but haughtily lays itself down, when the enemy has retired, in order in the arms of sleep to collect forces for a new combat. The animal in such a case grunts with satisfaction, throws itself on its back, scratches itself with its fore-feet, attends to its toilet, or cools itself by slowly fanning with one of its hind-feet; but it is always on the alert and ready for a new fight until it is tired out and meets its match, and is

¹ The details here given of the sea-bear's mode of life are mainly taken from Henry W. Elliot's work quoted above.



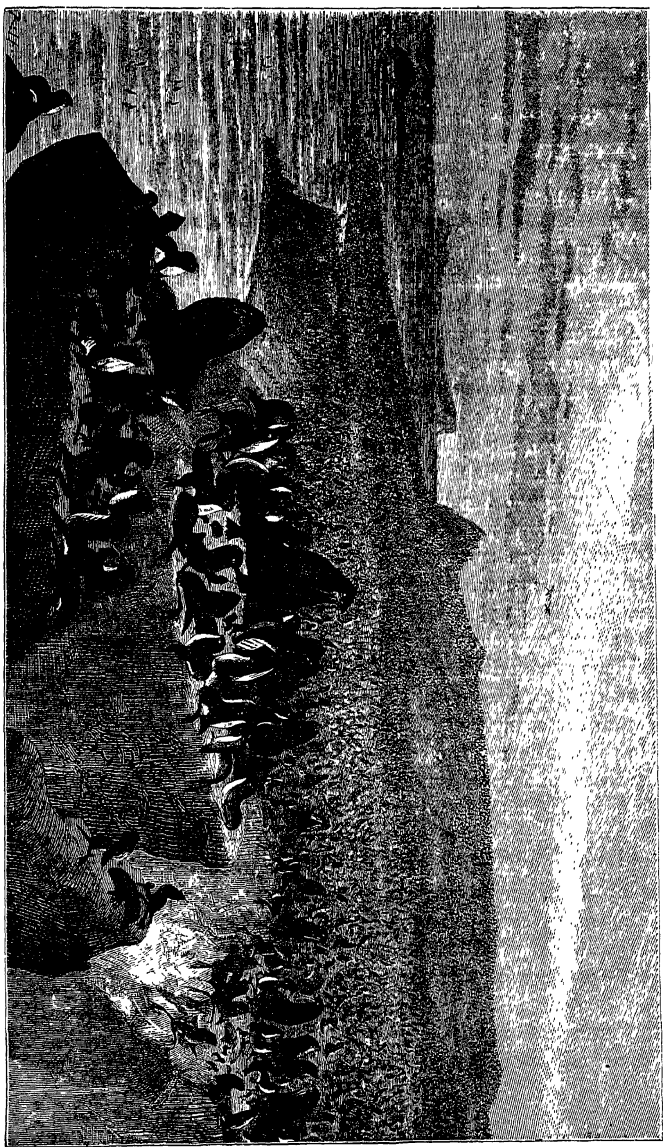
SEA-BEARS

Male, Female, and Young.

(From a water-colour painting by H. W. Elliot.)

driven farther up from the beach. One of the most peculiar traits of these animals is that during their stay on land they unceasingly use their hind-paws as fans, and sometimes also as parasols.

In the middle of June the females come up from the sea. At the water's edge they are received in a very gallant way by some strong oxen that have succeeded in securing for themselves places next the shore, and now are bent by fair means or foul on annexing the fair for their harem. But scarcely is the female that has come up out of the water established with seal-ox No. 1, than he rushes towards a new beauty on the surface of the water. Seal No. 2 now stretches out his neck and without ceremony lays hold of No. 1's spouse, to be afterwards exposed to a similar trick by No. 3. In such cases the females are quite passive, never fall out with each other, and bear with patience the severe wounds they often get when they are pulled about by the combatants, now in one direction, now in another. All the females are finally distributed in this way after furious combats among the males, those of the latter who are nearest the beach getting from twelve to fifteen consorts to their share. Those that have been compelled to settle farther from the shore must be content with four or five. Soon after the landing of the females they bring forth their young, which are treated with great indifference and are protected by the adopted father only within the boundaries of the harem. Next comes the pairing season, and when it has passed there is an end to the arrangement and distribution into families at first so strictly maintained. The seal-oxen, rendered lean by three months' absolute fasting, by degrees leave the "rookery," which is taken possession of by the sea-cows, the young, and a number of young males that have not ventured to the place before. In the middle of September, when the young have learned to swim, the place is quite abandoned, with the exception of single animals that have for some reason remained behind. In long continued heavy rain many of the animals seek protection in the sea, but return when the rain ceases. Continuous heat and sunshine besides exert the same influence; cold, moist air, with cloud-concealed sun, on the other hand draw them up on land by thousands.



"SEAL-ROOKERY" ON ST. PAUL'S ISLAND, ONE OF THE PRIBYLOV ISLANDS
(After a drawing by H. W. Elliot)

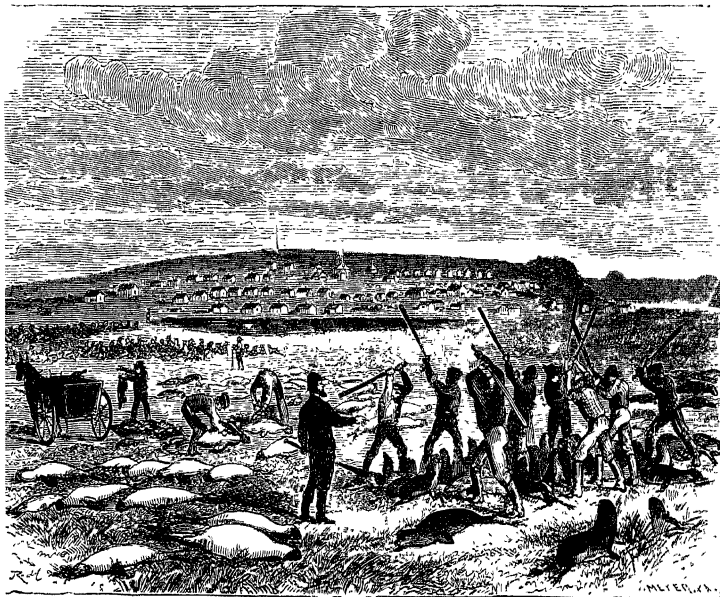
Males under six years of age cannot like the older males possess themselves, by fighting, of spouses and a home of their own. They therefore collect, along with young females, in herds of from several thousand to several hundred thousand, on the shores between the rookeries proper, some of them close packed next the water's edge, others scattered in small flocks a little farther from the shore on the grass. They play with each other with a frolicsomeness like that of young dogs, and when tired lie down to sleep at a common signal in all conceivable positions.

It is these unfortunate useless bachelors which at the properly managed hunting stations yield the contingent for slaughter. For this purpose they are slowly driven by the natives from the shore about half a mile an hour, and with frequent rests, to the place of slaughter, situated about a mile from the shore. Then the females and the young ones are driven away, as well as the males whose skins are unserviceable. The rest are first stunned with a blow on the head, and afterwards stabbed with a knife.

While the *Vega* steamed down towards Behring Island we met, far from land, herds of sea-bears, which followed the vessel from curiosity for long stretches. Being unacquainted with the sea-bear's mode of life, I believed from this circumstance that they had already left their summer haunts, but on our arrival at the colony I was informed that this was not the case, but that a very great number of animals still remained at the rookery on the north-eastern point of the island. Naturally one of our first excursions was to this place, situated about twelve miles from the village. Such a journey cannot now be undertaken alone and unattended, because even an involuntary want of caution might easily cause much loss to the natives, and to the company that owns the right of hunting. During the journey we were accordingly accompanied by the chief of the village, a black-haired stammering Aleutian, and "the Cossack," a young, pleasant, and agreeable fellow, who on solemn occasions wore a sabre nearly as long as himself, but otherwise did not in the least correspond to the Cossack type of romance.

The journey was performed in large sledges drawn by ten dogs over snow-free rounded hills and hill-plateaus covered

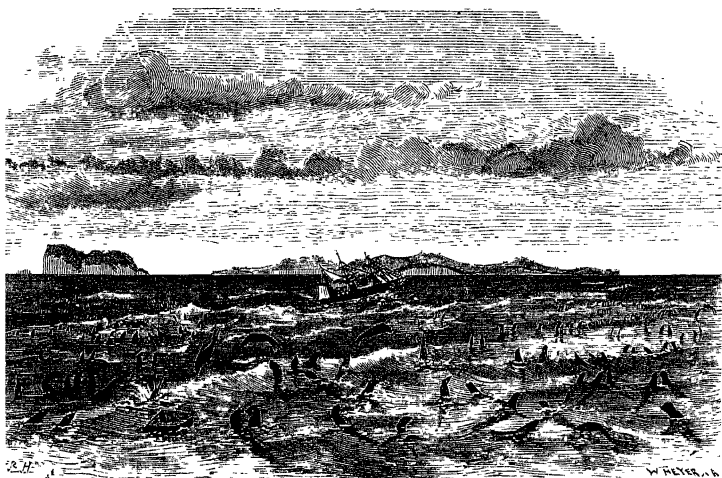
with a rather scanty vegetation, and through valleys treeless as the mountains, but adorned with luxuriant vegetation, rich in splendid lilies, syngenesia, umbellifera, &c. The journey was sometimes tedious enough, but we now and then went at a rattling rate, especially when the dog-team descended the steep mountain slopes, or passed through the morasses and the clay puddles



SLAUGHTER OF SEA-BEARS.
(After a drawing by H. W. Elliot.)

formed in the well-worn track. The driver was bespattered from top to toe with a thick layer of mud, an inconvenience attending the unusual team which was foreseen before our departure from the colony, in consequence of which our friends there urged that, notwithstanding the fine weather, we should all take overcoats. The dog team was kept pretty far from the shore in order not to

frighten the seals, and then we went on foot to the place where the sea-bears were, choosing our way so that we had the wind in our faces. We could in this way, without disturbing them, come very near the animals, which, according to the somewhat exaggerated statement made to us on the spot, were collected at the time to the number of 200,000, on the promontory and the neighbouring shores. We obtained permission to creep,



SEA-BEARS ON THEIR WAY TO THE "ROOKERIES."

(After a drawing by H. W. Elliot)

accompanied by our guide, close to a herd lying a little apart. The older animals became at first somewhat uneasy when they observed our approach, but they soon settled down completely, and we had now the pleasure of beholding a peculiar spectacle. We were the only spectators. The scene consisted of a beach covered with stones and washed by foaming breakers, the background the immeasurable ocean, and the actors thousands of wonderfully formed animals. A number of old males lay still

and motionless, heedless of what was going on around them. Others crept clumsily on their small short legs between the stones of the beach, or swam with incredible agility among the breakers, played, caressed each other, and quarrelled. At one place two old animals fought, uttering a peculiar hissing sound, and in such a way as if the attack and defence had been carried out in studied attitudes. At another place a feigned combat was going on between an old and a young animal. It looked as if the latter was being instructed in the art of fighting. Everywhere the small black young ones crept constantly backwards and forwards among the old sea-bears, now and then bleating like lambs for their mothers. The young ones are often smothered by the old when the latter, frightened in some way, rush out into the sea. After such an alarm hundreds of dead young are found on the shore.

"Only" thirteen thousand animals had been killed that year. Their skinned carcasses lay heaped on the grass by the shore, spreading far and wide a disagreeable smell, which, however, had not frightened away their comrades lying on the neighbouring promontory, because, even among them, a similar smell prevailed in consequence of the many animals suffocated, or killed in fight with their comrades, and left lying on the shore. Among this great flock of sea-bears sat enthroned on the top of a high stone a single sea-lion, the only one of these animals we saw during our voyage.

For a payment of forty roubles I induced the chief of the village to skeletonise four of the half-putrefied carcasses of the sea-bear left lying on the grass; and I afterwards obtained, by the good-will of the Russian authorities, and without any payment, six animals, among them two living young, for stuffing. Even the latter we were compelled to kill, after in vain attempting to induce them to take some food. One of them was brought home in spirits for anatomical examination.

The part of Behring Island which we saw forms a high plain resting on volcanic rocks,¹ which, however, is interrupted at many

¹ According to a statement by Mr. Grebnitski, tertiary fossils and coal seams are also to be found on Behring Island, the former north of the colony

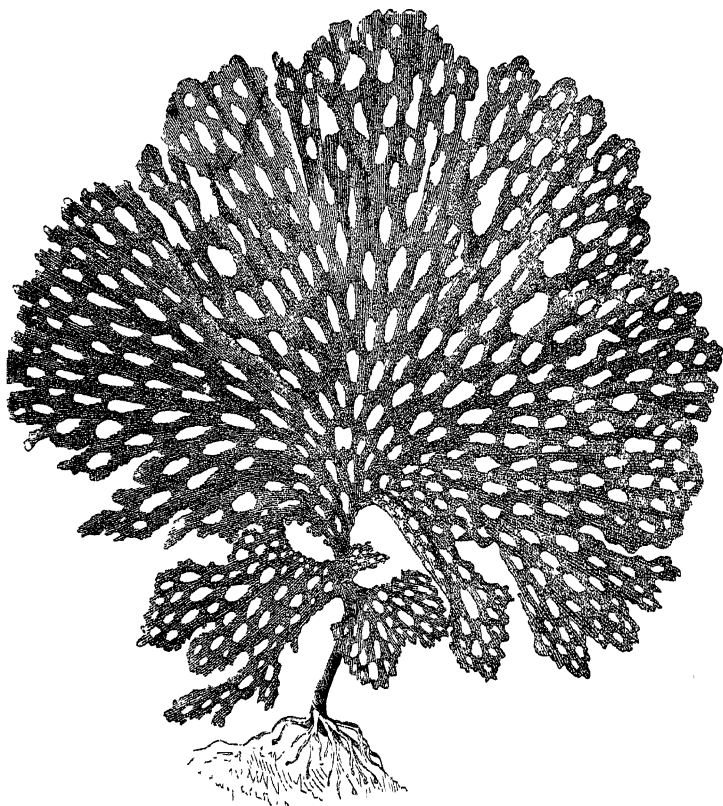
places by deep kettle valleys, the bottoms of which are generally occupied by lakes which communicate with the sea by large or small rivers. The banks of the lakes and the slopes of the hills are covered with a luxuriant vegetation, rich in long grass and beautiful flowers; among them an iris cultivated in our gardens, the useful dark reddish-brown Sarana lily, several orchids, two species of rhododendron with large flowers, umbellifera as high as as a man, sunflower-like syanthea, &c.

Behring Island might without difficulty feed large herds of cattle, perhaps as numerous as the herds of sea-cows that formerly pastured on its shores. The sea-cow besides had chosen its pasture with discrimination, the sea there being, according to Dr. Kjellman, one of the richest in algæ in the world. The sea-bottom is covered at favourably situated places by forests of seaweed from sixty-five to one hundred feet high, which are so dense that the dredge could with difficulty force its way down into them, a circumstance which was much against the dredging. Certain of the algæ are used by the natives as food.

In the course of our journey to the hunting place we had an opportunity, during a rest about halfway between it and the village, of taking part in a very peculiar sort of fishing. The place where we rested was in an even grassy plain, resembling a natural meadow at home, crossed by a large number of small rivulets. They abounded in several different kinds of fish, among them a *Coregonus*, a small trout, a middle-sized long salmon with almost white flesh though the colour of its skin was a purplish-red, another salmon of about the same length but thick and hump-backed. These fish were easily caught. They were taken with the hand, were harpooned with common unshod sticks, were stabbed with knives, caught with the insect net, &c. Other kinds of salmon with deep red flesh are to be found in the large rivers of the island. We obtained here for a trifle a welcome change from the preserved provisions of which we had long ago become quite tired. The Expedition was also presented by the Alaska

in the interior, the latter at the beach south of Behring's grave. Also in the neighbourhood of the colony the volcanic rock-masses are under-stratified by thick sandy beds.

Company with a fine fat ox, milk, and various other provisions, and I cannot sufficiently value the good-will shown to us, not



ALGA FROM THE SHORE OF BEHRING ISLAND.

Thalassiophyllum Clathrus, Post and Rupr.

One-fourth of the natural s.ze.

only by the Russian official, N. GREBNITSKI, a zealous and skilful naturalist, but also by the officials of the Alaska Company

and all others living on the island with whom we came into contact.¹

The *Vega* left Behring Island on the afternoon of the 19th August, and anchored at Yokohama on the evening of the 2nd September. The first part of the passage, while we were still in the cold northerly Polar Sea current, was favoured by fair winds and moderate heat. The surface temperature of the sea was from $+9^{\circ}$ to $+10^{\circ}$ C. On the 25th August in $45^{\circ} 15' N. L.$ and $156^{\circ} E. L.$ from Greenwich the temperature of the sea-water began to rise so rapidly that the thermometer in 40° Lat. and $147^{\circ} 41' Long.$ already showed $+23^{\circ} 4$ at the surface. This indicated that we had come from the cold current favourable to us into Kuro-sivo, the Gulf Stream of the Pacific. The wind was now at times unfavourable and the heat oppressive, notwithstanding the frequent rain showers accompanied by lightning and heavy squalls. In such unfavourable weather on the 31st August the mainmast of the *Vega* was struck by lightning, the flash and the report being of excessive violence. The vane was broken loose and thrown into the sea along with some inches of the pole. The pole itself was split pretty far down, and all on board felt a more or less violent shaking, the man who felt it most standing at the time near the hawse-hole. The incident was not attended by any further noteworthy unpleasant consequences.

On our arrival at Yokohama we were all in good health and the *Vega* in excellent condition, though, after the long voyage, in want of some minor repairs, of docking, and possibly of coppering. Naturally among thirty men some mild attacks of illness could not be avoided in the course of a year, but no disease had been generally prevalent, and our state of health had constantly been excellent. Of scurvy we had not seen a trace.

¹ The first European who welcomed us after the completion of the North-east passage was a Fin now settled in California, from Björkboda works in Kimito parish, in which I had lived a great deal when a youth. He was sent by the Alaska Company to do some work on Behring Island. As we steamed towards the colony he rowed to meet us, and saluted us with the cry "är det Nordenskiöld?" ("Is it Nordenskiöld?") His name was Isak Andersson.

CHAPTER XIII.

Arrival at Yokohama—The stranding of the steamer *A. E. Nordenskiöld*—*Fêtes* in Japan—Audience of the Mikado—Visit to Enoshima—The Chinese in Japan—Voyage to Kobe—Purchase of Japanese books—Kioto—Biwa Lake—The Inland Sea—Nagasaki—Mogi—Fossil Plants—Departure from Japan—Hong Kong—Canton—Labuan—Singapore—Ceylon.

WHILE we sailed, or more correctly, steamed—for we had still sufficient coal remaining to permit the engine to be used—up the Bay of Yedo, the coasts were for the most part concealed with mist, so that the summit of Fusiyama and the contours of the shore only now and then gleamed forth from the fog and cloud. The wind besides was against us, on which account it was 9.30 in the evening of the 2nd September before we could anchor in the haven that had been longed-for for such a length of time. I immediately hastened on shore, along with Captain Palander, in order to send home a telegram across Siberia about the fortunate issue of the voyage of the *Vega*. At the telegraph station I was informed that the Siberian line was interrupted by inundations for a space of 600 versts, and that the telegram must therefore be sent by India, whereby the cost was nearly doubled. The telegraph officials also made difficulties about taking the foreign gold coin of various kinds which I had about me. Fortunately the latter difficulty was immediately removed by the accidental presence of the Russian consul, Mr. PELIKAN, while I was treating with the telegraph officials. When he heard that it concerned the sending home of a telegram from the much-talked-of *Vega*

expedition, he immediately offered to arrange the affair until I had time to operate on the letter of credit I carried with me from Messrs. James Dickson & Co. of Gothenberg. Soon after I met with the Swedish consul, Mr. VAN OORDT, who gave us a large parcel of letters from home. It was very gladly received by most of us, as, so far as I know, it did not bring the thirty members of the expedition a single unexpected sorrowful message. I got, however, soon after landing, an unpleasant piece of news, viz. that the steamer *A. E. Nordenskiöld*, which Mr. Sibiriakoff had sent to Behring's Straits and the Lena to our relief, had stranded on the east coast of Yesso. The shipwreck fortunately had not been attended with any loss of human life, and the vessel lay stranded on a sandbank in circumstances which made it probable that it would be got off without too great cost.

As the report of our arrival spread, I was immediately waited upon by various deputations with addresses of welcome, invitations to *fêtes*, clubs, &c. A series of entertainments and festivities now began, which occupied a great part of the time we remained in this splendid and remarkable country.

On the 10th September a grand dinner was given at the Grand Hotel, the principal European hotel—and very well kept—of Yokohama, by the Dutch minister, Chevalier VAN STOETWEGEN, who at the same time represents Sweden and Norway in Japan. The members of the Expedition were here introduced to several members of the Japanese Government.

We were invited to a *déjeuner à la fourchette*, at one o'clock p.m. on the 11th September, at the Imperial summer palace Hamagoten, by Admiral KAWAMURA, minister of marine. At this entertainment there were present, besides the scientific men and officers of the *Vega*, and our minister, Herr van Stoetwegen, several of the ministers and highest officials of Japan. The entertainment was very pleasant, and all, from our intelligent host to the Premier, Daiyo-daiyin, and the Imperial Prince, SANYO SANITOMI, showed us much friendliness.

On the 15th September there was a grand entertainment in Tokio, given by the Tokio Geographical Society, the Asiatic Society

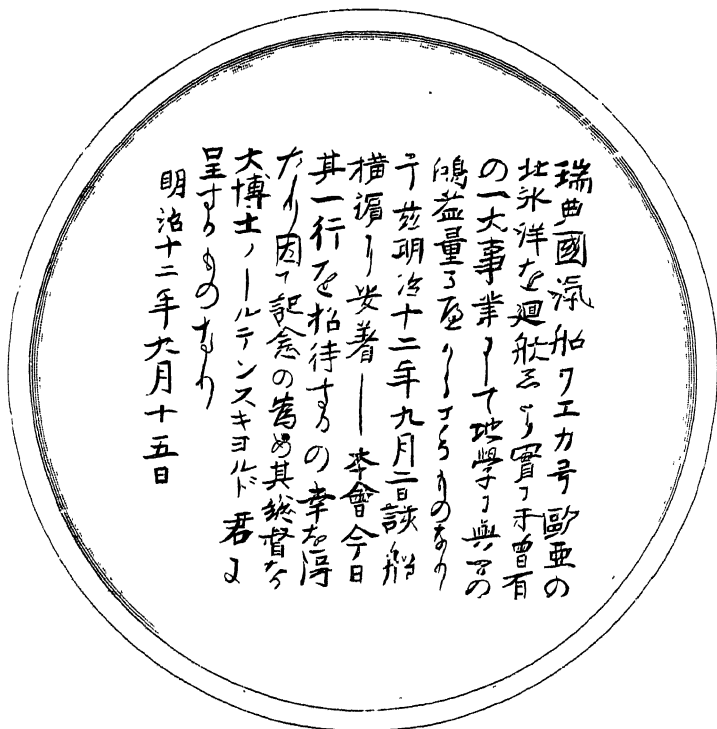
of Japan, and the German Asiatic Society. It was held in the great hall in Koku-Dai-Gaku, a large stone building surrounded with beautiful trees, which were lighted up for the occasion by a number of variegated paper lanterns. Several Japanese ladies



THE FIRST MEDAL WHICH WAS STRUCK AS A MEMORIAL OF THE VOYAGE OF THE "VEGA"
Size of the original

dressed in European style took part in the entertainment. I sat by the side of the chairman, Prince KITA-SHIRA-KAVA, a young member of the imperial house, who had served some time in the German army and speaks German very well. The dinner

was quite European, with a large number of speeches, principally in European languages, but also in Japanese. Before every guest lay a map, of the form of a fan, with the course of the *Vega* marked upon it. As a memorial of the feast I received some days

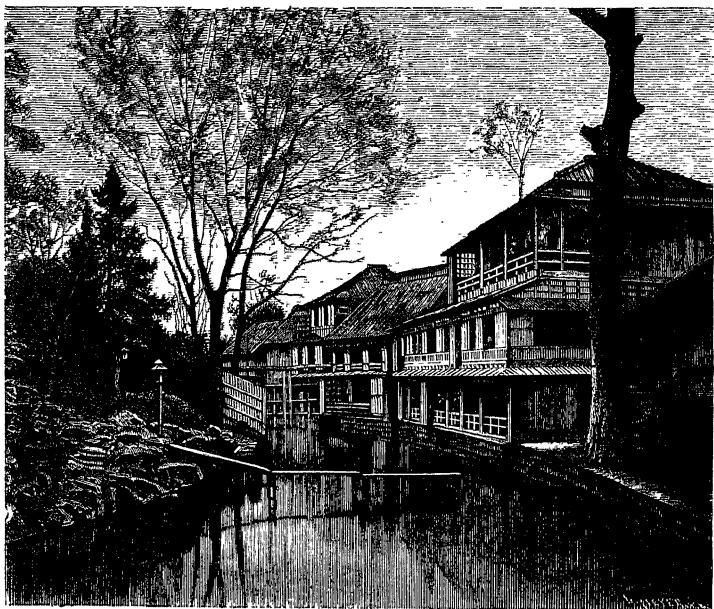


THE FIRST MEDAL WHICH WAS STRUCK AS A MEMORIAL OF THE VOYAGE OF THE "VEGA."
Size of the original.

after a large medal in silver inlaid in gold, of which drawings are given above.

On the forenoon of the 17th September we were presented at the Court of the Mikado in Tokio by the Swedish-Dutch

minister. We were conveyed from the railway station in imperial equipages, consisting of simple but ornamental and convenient *suflett* carriages, each drawn by a pair of beautiful black horses of no great size. As is common in Japan, a running groom, clad in black, accompanied each carriage. The reception took place in the imperial palace, a very modest wooden building. The rooms



JAPANESE HOUSE IN TOKIO

we saw were furnished, almost poorly, in European fashion. We first assembled in an antechamber, the only remarkable ornament of which was a large piece of nephrite, which was a little carved and had a Chinese inscription on it. Here we were met by some of the ministers and the interpreter. After a short conversation, in the course of which the interpreter got a sight of the written

speech, or more correctly the words of salutation, I was to speak, we were conducted into an inner apartment where the Emperor, clad in a uniform of European style and standing in front of a throne, received us. The only thing unusual at our reception was that we were requested at our departure not to turn our backs to the Emperor, and on entering and departing to make three bows, one at the door, another when we had come forward a little on the floor, and one at the place where we were to stand. After we had been presented the Emperor read a speech in Japanese, which was translated into French by the interpreter, and of which, before we left the place, a beautiful copy was given me. I then read my salutation, on which our minister, van Stoetwegen, said a few words, and got some words in reply. After leaving the imperial chamber we were entertained in the anteroom with Japanese tea and cigars. The two princes who had taken part in the entertainment of the 15th, came and talked a little with us, as did the minister of foreign affairs.

On the 18th September several of the members of the *Vega* expedition were invited to a *déjeuner à la fourchette* by Admiral Kawamura, minister of marine. This entertainment had an interest for us because we were here for the first time received into a Japanese home. I sat at table by the side of Lady Kawamura. Even the children were present at the entertainment. Lady Kawamura was dressed in the Japanese fashion, tastefully but very plainly, if we except a heavy gold chain encircling the waist. In other respects the entertainment was arranged according to the European mode, with a succession of dishes and wines, both in abundance, according to the laws of gastronomy. When it was over our host offered us a drive in a carriage, during which I rode with the lady and one of the children, a little girl about ten years of age, who would have been very beautiful if she had not been disfigured, in the eyes of Europeans, by the thick white paint that was evenly spread over her whole face, and gave it a sickly appearance. Lady Kawamura herself was not painted, nor was she disfigured with blackened teeth.

All women of the lower classes, and even most of the higher,

wear the Japanese dress. The more distinguished ladies are often exceedingly beautiful, they have in particular beautiful necks. Unfortunately they are often disfigured by paint, for which the ladies here appear to have a strong liking. The dress of the younger women, even among the poor, is carefully attended to;

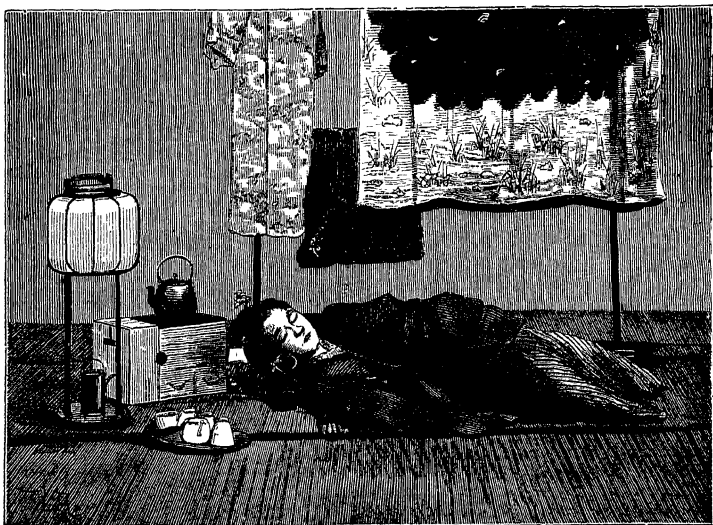


JAPANESE LADY AT HER TOILETTE.

it is not showy but tasteful, and nearly the same for all classes. Their manners are very attractive and agreeable. The women of the upper classes are beginning to take part in the social life of the Europeans, and all European gentlemen and ladies with whom I have conversed on this point agree in stating that there is no

difficulty in the way of a Japanese woman leaving the narrow circle to which she was formerly confined, and entering with pleasure and womanly dignity into European society. She appears to be born "a lady."

From Yokohama excursions were made to all the most remarkable places round about, and everything was done both

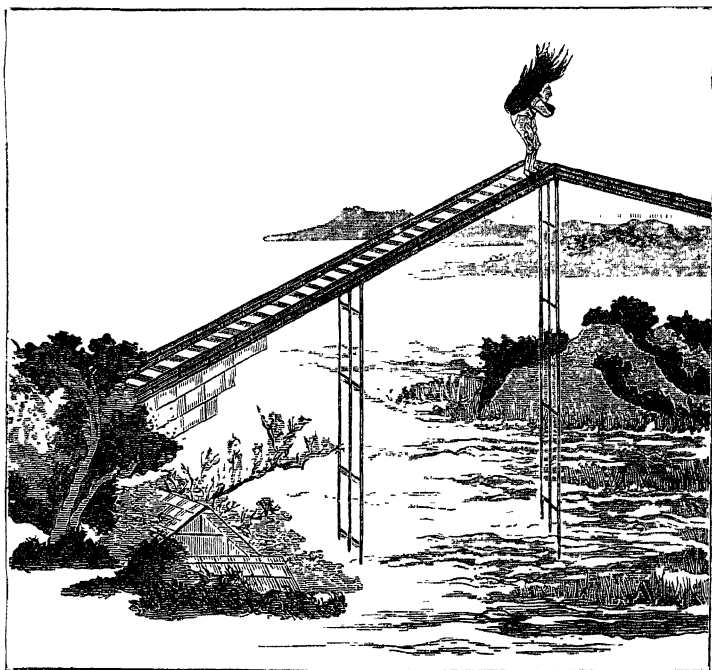


JAPANESE BEDROOM.

by the Japanese and by the foreign residents to do honour to the officers and men of the *Vega*.

After the Swedish-Dutch minister had further given us a splendid farewell dinner at the Grand Hotel, to which, as before, the Japanese ministers and the representatives of the foreign powers in Japan were invited, we at last weighed anchor on the 11th October to prosecute our voyage. At this dinner we saw for the first time the Chinese embassy which had come to Japan with the view of settling the troublesome Loo-Choo affair,

which threatened to lead to a war between the two great powers of Eastern Asia. The Chinese ambassadors were, as usual, two in number, being commissioned to watch each other. One of them laughed immoderately at all that was said during dinner, although he did not understand a word. According to what I



JAPANESE BRIDGE.
(After a Japanese drawing)

was told by one who had much experience in the customs of the heavenly empire, he did this, not because he heard or understood anything worth laughing at, but because he considered it good manners to laugh.

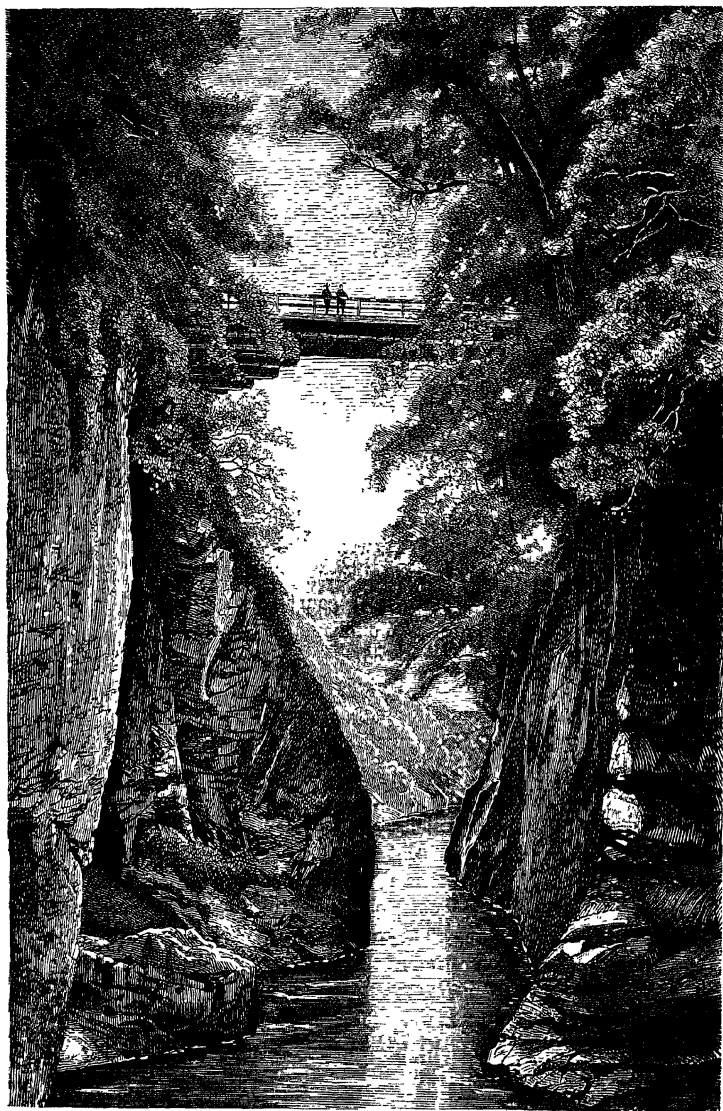
Remarkable was the interest which the Chinese labourers

settled at Yokohama took in our voyage, about which they appeared to have read something in their own or in the Japanese newspapers. When I sent one of the sailors ashore to execute a commission, and asked him how he could do that without any knowledge of the language, he replied, "There is no fear, I always meet with some Chinaman who speaks English and helps me." The Chinese not only always assisted our sailors as interpreters without remuneration, but accompanied them for hours, gave them good advice in making purchases, and expressed their sympathy with all that they must have suffered during our wintering in the high north. They were always cleanly, tall, and stately in their figures, and corresponded in no particular to the calumnious descriptions we so often read of this people in European and American writings.

From Yokohama the course was shaped for Kobe, one of the more considerable Japanese ports which have been opened to Europeans. Kobe is specially remarkable on account of its having railway communication with Osaka, the most important manufacturing town of Japan, and with Kioto, the ancient capital and seat of the Mikado's court for centuries.

I had already begun at Yokohama to buy Japanese books, particularly such as were printed before the opening of the ports to Europeans. In order to carry on this traffic with greater success, I had procured the assistance of a young Japanese very familiar with French, Mr. OKUSHI, assistant in Dr. Geertz' chemical laboratory at Yokohama. But because the supply of old books in this town, which a few years ago had been of little importance, was very limited, I had at first, in order to make purchases on a larger scale, repeatedly sent Mr. Okushi to Tokio, the seat of the former Shogun dynasty, and from that town, before the departure of the *Vega* from Yokohama, to Kioto, the former seat of learning in Japan. The object of the *Vega's* call at the port of Kobe was to fetch the considerable purchases made there by Mr. Okushi.¹

¹ The number of the works which the collection of Japanese books contains is somewhat over a thousand. The number of volumes amounts to five or six thousand; most of the volumes, however, are not larger than one of our books of a hundred pages.



JAPANESE LANDSCAPE.

A whole day of the short time which was allowed me to study the remarkable things of Kioto I devoted to Lake Biwa, because lakes are exceedingly uncommon in the south, for they occur only in the countries which have either been covered with glaciers in the most recent geological periods, or, in consequence of the action of volcanic forces, have been the scene of violent disturbances of



BURDEN-BEARERS ON A JAPANESE ROAD
(Japanese drawing)

the surface of the earth. I believed that Lake Biwa would form an exception to this, but I was probably mistaken; for tradition relates that this lake was formed in a single night at the same time that the high volcanic cone of Fusi-yama was elevated. This tradition, in its general outline, corresponds so closely with the teaching of geology, that scarcely any geologist will doubt its truth.

After our arrival at the inn we had to wait a very long time for the steamer I had ordered. On this account I thoughtlessly enough broke out in reproaches on my excellent Japanese adjutants, who, however, received my hard words only with friendly smiles, which increased still further my impatience at the loss of time which was thus occasioned. It was not until far



JAPANESE COURT DRESS.

on in the day, when I was already out dredging from a small steamer, that I was informed as to the cause of the delay. The Biwa Steamship Company had, at the request of the Governor, intended to place at my disposal a very large boat well provided with coal, but after taking the coal on board it had sunk so deep that it grounded in the mud of the harbour. We had already got

far out with the little steamer when the large one at last got off. I was now obliged to exchange vessels in order to be received "in a more honourable way." It was not until this took place that I was informed that I was guest and not master, on which account I was obliged to employ the rest of the afternoon in excusing my former violent behaviour, in which, with the help of friendly words, beer, and red wine, I succeeded pretty well, to judge by the mirth which soon began to prevail among my now very numerous Japanese companions.

On the little steamer I had ordered two of my crew whom I had brought with me from the *Vega* to prepare a meal for the Japanese and ourselves. In this way the dinner that had been arranged for us, without my knowledge, became superfluous. I was obliged instead to receive as a gift the provisions and liquors purchased for the dinner, consisting of fowls, eggs, potatoes, red wine and beer, giving at the same time a receipt as a matter of form.

During our excursion on the lake we met with various boats laden with sea-weed, which had been taken up from the bottom of the lake, to be used as manure for the neighbouring cultivated fields. Partly among these algæ, partly by dredging, Lieut. Nordquist collected various interesting fresh-water crustacea (Paludina, Melania, Unio, Planorbis, &c.), several sorts of



NOBLE IN ANTIQUE DRESS.

shrimps (a Hippolyte) small fishes, &c. Lake Biwa abounds in fish, and harbours besides a large clumsily-formed species of lizard. In order to make further collections of the animal forms occurring there, Lieut. Nordquist remained at the lake till next day. I, on the other hand, went immediately back to Kioto, arriving there in the evening after nightfall.

On the morning of the 18th October the *Vega* again weighed anchor, to proceed on her voyage. The course was shaped through the Inland Sea of Japan for Nagasaki. The weather was clear and fine, so that we had a good opportunity of admiring the magnificent environs of the Inland Sea. They resemble much the landscape in a northern archipelago. The views here are however more monotonous in consequence of there being less variety in the contours of the mountains.

We landed at two places, first at Hirosami. Here some fishermen's cabins and some peasants' houses formed a little village at the foot of a high, much-weathered granite ridge. The burying-place was situated near one of the houses, close to the shore. On an area of some hundred square yards there were numerous gravestones, some upright, some fallen. Some were ornamented with fresh flowers, at one was a Shinto shrine of wooden pins, at another stood a bowl with rice and a small *saki* bottle. Our zoologists here made a pretty rich collection of littoral animals, among which may be mentioned a cuttle-fish which had crept down amongst the wet sand, an animal that is industriously searched for and eaten by the natives. Among the cultivated plants we saw here, as many times before in the high-lying parts of the country, an old acquaintance from home, namely buckwheat.

The second place the *Vega* anchored at was a peasant village right opposite Shimonoseki, which has a melancholy reputation in Japanese history from the deeds of violence done here by a united English, French, Dutch, and American fleet of seventeen vessels on the 4th and 5th September, 1864, in order to compel the Japanese to open the sound to foreigners, and the unreasonably heavy compensation which after the victory was won they demanded from the conquered. Although only fifteen years have

passed since this occurred, there appears to be no trace of bitter feeling towards Europeans among the inhabitants of the region.

On the surrounding hills we saw thickets of the Japanese wax tree, *Rhus succedaneus*. The wax is pressed out of the berries of this bush with the help of heat. It is used on a large scale in making the lights which the natives themselves burn, and is exported bleached and refined to Europe, where it is sometimes used in the manufacture of lights. Now, however, these wax lights are increasingly superseded by American kerosene oils. The price has fallen so much that the preparation of vegetable wax is now said scarcely to yield a profit.¹

We left this place next morning, and on the 21st October the *Vega* anchored in the harbour of Nagasaki. My principal intention in visiting this place was to collect fossil plants, which I supposed would be found at the Takasima coal-mine, or in the neighbourhood of the coal-field. One of the Japanese with whom I conversed told me that an exhibition of the products of nature and art in the region was being arranged, and that among the objects exhibited I might possibly find what I sought for. Of course I immediately availed myself of the opportunity to see one of the many Japanese local exhibitions of which I had heard so much. It was yet in disorder, but I was, at all events, willingly admitted, and thus had an opportunity of seeing much that was instructive to me, especially a collection of rocks from the neighbourhood. Among these I discovered at last, to my great satisfaction, some beautiful fossil plants from Mogi, a place not far from Nagasaki.

The following morning I started for Mogi, accompanied by the Japanese attendant I had with me from Kobe, and by another adjutant given me by the very obliging governor of Nagasaki. None of the mountain regions I have seen in Japan are so well cultivated as the environs of Nagasaki. Every place that is somewhat level, though only several hundred square yards in extent, is used for growing some of the innumerable cultivated

¹ Further information on this point is given by Henry Gribble in "The Preparation of Vegetable Wax" (*Transactions of the Asiatic Society of Japan*, vol. iii. part i. p. 94. Yokohama, 1875).

plants of the country, principally rice: but as such easily cultivated places occur in only limited numbers, the inhabitants have by industry and hard labour changed the steep slopes of the mountains into a succession of level terraces rising one above the other, all carefully watered by irrigating conduits.

Mogi is a considerable fishing-village lying at the seaside twelve miles south of Nagasaki in a right line, on the other side of a peninsula occupied by lava beds and volcanic tuffs, which projects from the island Kiushiu, which at that place is nearly cut asunder by deep fiords. When my arrival became known I was visited by the principal men of the village. We were soon good friends by the help of a friendly reception, cigars, and red wine. Among them the physician of the village was especially of great use to me. As soon as he became aware of the occasion of my visit he stated that such fossils as I was in search of did indeed occur in the region, but that they were only accessible at low water. I immediately visited the place with the physician and my companions from Nagasaki, and soon discovered several strata containing the finest fossil plants one could desire. During this and the following day I made a rich collection, partly with the assistance of a numerous crowd of children who zealously helped me in collecting. They were partly boys and partly girls, the latter always having a little one on their backs. These little children were generally quite bare-headed. Notwithstanding this they slept with the crown of the head exposed to the hottest sun-bath on the backs of their bustling sisters, who jumped lightly and securely over stocks and stones, and never appeared to have any idea that the burdens on their backs were at all unpleasant or troublesome. According to Dr. A. G. NATHORST'S examination, the fossil plants which I brought home from this place belong to the more recent Tertiary formation.

After the inhabitants of Nagasaki had given us a grand parting feast, at which speeches were spoken in Japanese, Chinese, English, French, German, Italian, Dutch, Russian, Danish, and Swedish, a proof of the mixture of nationalities which prevailed there, the *Vega* again weighed anchor on the 27th October, in order to continue her voyage. We now left Japan to

commence in earnest our return, and on our departure we were saluted by the crews of two English gun-boats anchored in the harbour, the *Hornet* and the *Sylvia*, manning the yards and bulwarks. It was natural that the hour of departure, after fifteen months' absence from home, should be looked forward to with joy. But our joy was mixed with a regretful feeling that we were so soon compelled to leave—without the hope of ever returning—the magnificent country and noble people among whom a development is now going on which probably will not only give a new awakening to the old cultured races of Eastern Asia, but will also prepare a new soil for European science, industry, and art. It is difficult to foresee what new undreamed-of blossoms and fruit this soil will yield. But the Europeans are perhaps much mistaken who believe that the question here is only that of clothing an Asiatic feudal state in a modern European dress. Rather the day appears to me to dawn of a time in which the countries round the Mediterranean of eastern Asia will come to play a great part in the further development of the human race.

Leaving Nagasaki on the 27th October, we were able to anchor in the harbour of Hong Kong as early as the 2nd November. There was of course no prospect of being able to accomplish anything for the benefit of science during a few days' stay in a region which had been examined by naturalists innumerable times before, but I touched at this harbour to meet the expressed wish of one of the members of the expedition not to leave eastern Asia without having during the voyage of the *Vega* seen something of the much talked-of Celestial Kingdom so different from all other lands.

For this purpose, however, Hong Kong is an unsuitable place. This rich and flourishing commercial town, which has been created by England's Chinese politics and opium trade, is a British colony with a European stamp that has little to show of real Chinese life, although the principal part of its population consists of Chinese. But at the distance of a few hours by steamer from Hong Kong lies the large old commercial city of Canton, which, though it has long been open to Europeans, is still purely Chinese,

with its peatstack-like architecture, its countless population, its temples, prisons, flower-junks, mandarins, pig-tailed street-boys, &c. Most of the members of the expedition made an excursion thither, and were rewarded with innumerable indescribable impressions from Chinese city life. We were everywhere received by the natives in a friendly way,¹ and short as our visit was, it was yet sufficient to dissipate the erroneous impressions which a number of European authors have been pleased to give of the most populous nation. We soon saw that we had to do with an earnest and industrious people, who, indeed, regard many things—virtue and vice, joy and sorrow—in quite a different way from us, but towards whom we, on that account, have by no means the right to assume the position of superiority which the European is so ready to claim towards coloured races.

At Hong Kong we met with a very gratifying reception both from the Governor, Mr. POPE HENNESSY, and from the other inhabitants of the town. The former invited Captain Palander and me to live in the beautiful Governor's residence, gave a dinner, arranged a stately official reception in our honour, and presented to the Expedition a fine collection of dried plants from the exceedingly well-kept botanical garden of the city, which is under the charge of Mr. CHARLES FORD; the latter presented me with an address of welcome at a festive meeting in the City Hall, specially arranged for the purpose and numerously attended by the principal men of the town. The meeting was opened by the Chairman, Mr. KESWICK, with a speech of welcome, after which Mr. J. B. COUGHTRIE read and presented the address, bound in red silk and beautifully illuminated in black, gold, and red, with 414 signatures, among which many were by Chinese. The address ended with a hearty congratulation to us all and a promise of a

¹ Yet with one very laughable exception. I wished for zoological purposes to get one of the common Chinese rats, and with this object in view made inquiries through my interpreter at a shed in the street, where rats were said to be cooked for Chinese epicures. But scarcely had the question been put, when the old, grave host broke out in a furious storm of abuse, especially against the interpreter, who was overwhelmed with bitter reproaches for helping a "foreign devil" to make a fool of his own countrymen. All my protestations were in vain, and I had to go away with my object unaccomplished.

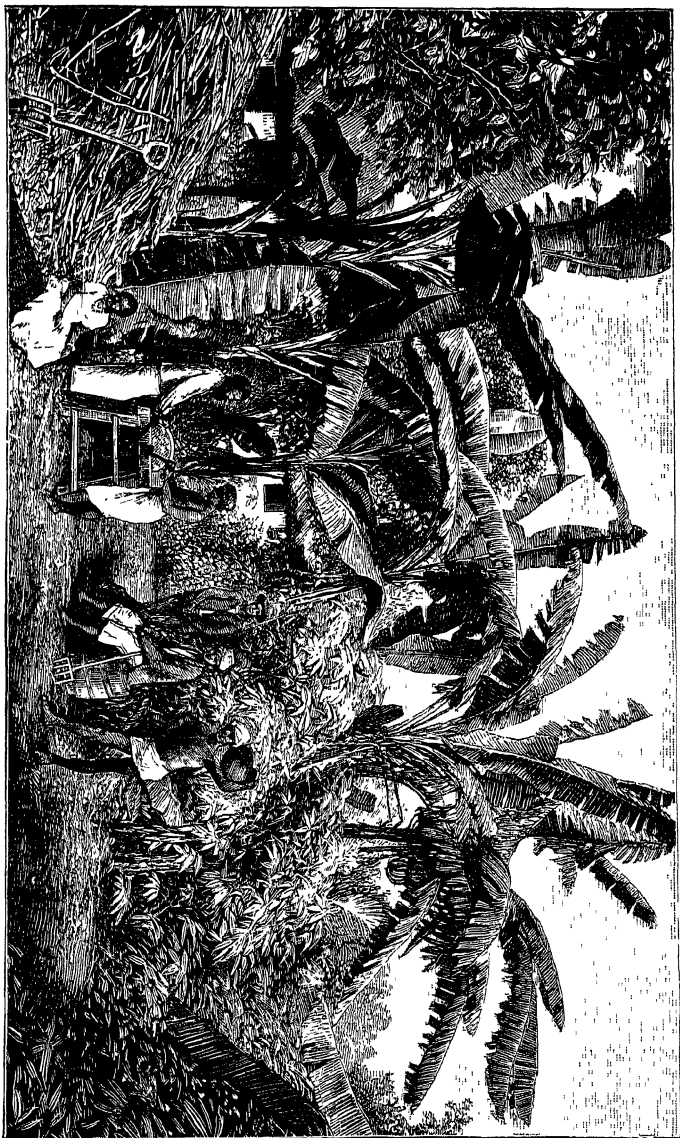
memorial of our visit to Hong Kong which should indicate the way in which the *Vega* expedition was appreciated there. Some time after our return home Palander and I received from members of the community of Hong Kong a splendid silver vase each.

Accompanied by the good wishes of many newly-acquired friends, we left the harbour of Hong Kong on the morning of the 9th November. It was my original intention to steer our course to Manilla, but the loss of time during our long stay in Japan compelled me to give up that plan. The course was shaped, however, not directly for Singapore, but for Labuan, a small English possession on the north side of Borneo. It was the coal-seams that attracted me to the place. For I wished to see whether I could not, in the neighbourhood of the equator itself, collect valuable contributions towards ascertaining the nature of the former equatorial climate. It was not until the 17th November that we could anchor in the harbour of Labuan.

Coal mining was stopped for the time, but orders were expected by every post to resume work. The road between the mine and the harbour town was at all events pretty well kept, and Mr. COOKE, one of the directors of the company, still lived at the place. He showed me all possible hospitality during the time I remained on the north side of the island for the purpose of collecting fossils. The rest of the time I was the guest of the acting Governor, Mr. TREACHER, a young and amiable man, who showed me several collections in natural history from Labuan and the neighbouring parts of Borneo, and after our return to Europe sent me a collection of leaves and fruits of the kinds of trees which now grow on the island. I expect that this collection will be very instructive in the study of the fossil plants we brought home with us.

On the 12th November, the *Vega* again weighed anchor to continue her voyage by Singapore to Point de Galle in Ceylon. Between Labuan and Singapore our progress was but slow, in consequence of the calm which, as might have been foreseen prevailed in the sea west of Borneo.

Singapore is situated exactly halfway, when a vessel, starting



A COUNTRY PLACE IN CEYLON

from Sweden, circumnavigates Asia and Europe. We stayed here from the 28th November to the 4th December, very hospitably received by the citizens of the town, both European and Asiatic, who seemed to vie with the inhabitants of Hong Kong in enthusiasm for the voyage of the *Vega*. We arrived at Galle on the 15th December, having during our passage from Singapore had a pretty steady and favourable monsoon. I allowed the *Vega* to remain in the harbour of Point de Galle, partly to wait for the mail, partly to give Dr. Almquist an opportunity of collecting lichens on some of the high mountain summits in the interior of the island, and Dr. Kjellman of examining its algæ, while I myself would have time to visit the famous gem-diggings of Ceylon. The return was as good as could have been expected considering our short stay at the place. Dr. Almquist's collection of lichens from the highest mountain of Ceylon, Pedrotalagalla, 2,500 metres high, was very large; Kjellman, by the help of a diver, made a not inconsiderable collection of algæ from the neighbourhood of the harbour; and from an excursion which I undertook in company with Mr. ALEXANDER C. DIXON, of Colombo, to Ratnapoora, the town of gems, where we were received with special kindness by Mr. COLIN MURRAY, assistant government agent, I brought home a fine collection of the minerals of Ceylon.

During the excursion I undertook from Galle to Ratnapoora, I visited a number of temples in order to procure Pali, Singhalese, and Sanscrit manuscripts; and I put myself in communication with various natives who were supposed to possess such manuscripts. They are now very difficult to get at, and the collection I made was not very large.

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CHAPTER XIV.

The Voyage Home—Christmas, 1879—Aden—Suez—Cairo—Excursion to the Pyramids and the Mokattam Mountains—Landing on Sicily by night—Naples—Rome—The Members of the Expedition separate—Lisbon—England—Paris—Copenhagen—Festive Entry into Stockholm—*Fêtes* there—Conclusion.

DURING our stay in Japan and our voyage thence to Ceylon I had endeavoured, at least in some degree, to preserve the character of the voyage of the *Vega* as a scientific expedition, an attempt which, considering the short time the *Vega* remained at each place, could not yield any very important results, and which besides was rendered difficult, though in a way that was agreeable and flattering to us, by I may almost say the tempestuous hospitality with which the *Vega* men were everywhere received during their visits to the ports of Japan and East Asia. It was besides difficult to find any untouched field of research in regions which were the seat of culture and civilisation long before the time when the forest began to be cut down and seed to be sown in the Scandinavian North, and which for centuries have formed the goal of exploring expeditions from all the countries of Europe. I hope, however, that the *Vega* will leave lasting memorials even of this part of her voyage through the contributions of Stuxberg, Nordquist, Kjellman, and Almquist to the invertebrate fauna and the sea-weed and lichen flora of East Asia, and by my collections of Japanese books, of fossil plants from Mogi and Labuan, &c.

With the new overpowering impression which nature and people exerted on those of us who now for the first time visited

Japan, China, India, Borneo, and Ceylon, it was however specially difficult, during a stay of a few days at each place, to preserve this side of the *Vega* expedition. I therefore determined after leaving Ceylon to let it drop completely, that is, from that point merely to *travel home*. An obligation of gratitude compels me to express the thanks of the *Vega* men for all the honours bestowed upon them, and all the goodwill they enjoyed during the last part of the voyage. Space forbids me to give a detailed description of the way in which the first circumnavigators of Asia and Europe were *fêted* in the ports and capitals of the civilised countries at which they touched on their way home.

We started from Point de Galle on the 22nd December, and arrived at Aden on the 7th January. On New Year's Eve the officers in the gun-room were surprised by a deputation from the forecastle clad in *pesks* as Chukches, who came, in good Swedish, mixed with a few words of the Pitlekai *lingua franca* not yet forgotten, to bring us a salutation from our friends among the ice of the north, thanks for the past and good wishes for the coming year, mixed with Chukchi complaints of the great heat hereaway in the neighbourhood of the equator, which for fur-clad men was said to be altogether unendurable.

We remained at Aden only a couple of days, received in a friendly manner by the then acting Swedish-Norwegian consul. In the harbour of Aden the *Vega* was saluted by the firing of twenty-one guns and the hoisting of the Swedish flag at the maintop of an Italian war vessel, the despatch steamer *Esploratore* under the command of Captain AMEZAGA.

We left Aden on the 9th January, and sailed the following day through Bab-el-Mandeb into the Red Sea, anchoring on the 27th January at the now inconsiderable port, Suez, situated at the southern entrance to the Suez Canal. Most of the scientific men and officers of the *Vega* expedition made an excursion thence to Cairo and the Pyramids, and were everywhere received in a very kind way. Among other things the Egyptian Geographical Society sent a deputation to welcome us under the leadership of the President of the Society, the American, STONE PACHA. The

Geographical Society gave a stately banquet in honour of the *Vega* expedition. An excursion was made to the Great Pyramids, and as far as the short time permitted, to other remarkable places in and around the heap of ruins of all kinds and from all periods, which forms the capital of the Egypt of to-day. During our visit to the Pyramids the Swedish Norwegian consul-general, BÖDTKER, gave us a dinner in the European hotel there, and the same evening a ball was given us by the Italian consul-general, DE MARTINO. From Cairo we returned, on the 2nd February, to Suez, and the following day the *Vega* weighed anchor to steam through the Suez Canal into the Mediterranean. We touched at Port Said for a few hours on the 5th February, after which we continued our voyage to Naples, the first European port we were to visit.

At Aden and in Egypt I had received several letters and telegrams informing me that great preparations were being made at Naples for our reception, and that repeated inquiries had been addressed to the Swedish consul-general regarding the day of our arrival, questions which naturally it was not so easy to answer, as our vessel, with its weak steam-power, was very dependent on wind and weather. It was hoped that the *Vega* might be signalled from the Straits of Messina, but we did not come to the entrance to the Straits until after sunset. I therefore ordered the *Vega* to lie-to there for some hours, while Lieut. Bove and I rowed ashore to send off telegrams announcing our arrival in Europe to Sweden, Naples, Rome, and other places. The shore, however, was farther off than we had calculated, and it was quite dark before it was reached. It was not without difficulty that in these circumstances we could get to land through the breakers in the open road quite unknown to us, and then, in coal-black darkness, find our way through thickets of prickly bushes to the railway which here runs along the coast. We had then to go along the railway for a considerable distance before we reached a station from which our telegrams could be despatched. Scarcely had we entered the station when we were surrounded by suspicious railway and coast-guard men, and we considered ourselves fortunate that they had not observed us on the way thither, for they would certainly

have taken us for smugglers, whom the coast-guard have the right to salute with shot. Even now we were overwhelmed with questions in a loud and commanding tone, but when they saw to what high personages our telegrams were addressed, and were informed by their countryman Bove, who wore his uniform, to what vessel we belonged, they became very obliging. One of them accompanied us back to our boat, after providing us with excellent torches which spread abundant light around our footsteps. They were much needed, for we were now compelled to share the astonishment of our guide that in the darkness we had succeeded in making our way over the rugged hills covered with cactus plants and bushy thickets between the railway and the coast, and along a railway viaduct which we had passed on our way to the station without having any idea of it. It was the last adventure of the voyage of the *Vega*, and my first landing on the glorious soil of Italy.

On the 14th February, at 1 p.m. the *Vega* arrived at Naples. The harbour swarmed with boats adorned with flags. Scarcely had the *Vega* anchored—or more correctly been moored to a buoy—when the envoy LINDSTRAND, the Swedish-Norwegian consul CLAUSEN, Prince TEANO, president of the Geographical Society, Commander MARTIN FRANKLIN, Commendatore NEGRI, and others came on board. The last-named, who nearly two years before had made a special journey to Sweden to be present at the departure of the *Vega*, now came from Turin commissioned by the Italian government, and deputed by the municipalities of Florence and Venice, the Turin Academy of Sciences, and several Italian and foreign geographical societies, to welcome the Expedition, which had now brought its labours to a happy issue.

After Herr Lindstrand, as King Oscar's representative, had welcomed the Expedition to Europe, and publicly conferred Swedish decorations on Palander and me, and two adjutants of the Italian Ministry of Marine had likewise distributed Italian orders to some of the *Vega* staff, some short speeches were exchanged, on which the members of the Expedition, accompanied by the persons enumerated above, landed in the Admiral's steam

launch under a salute of twenty-one guns from the Italian guard-ship. On the landing-quay, where a large crowd of the inhabitants of the city was assembled, the Swedish seafarers were received by the Syndic of Naples, Count GRUSSO, accompanied by a deputation from the municipality, &c. Here we were taken, between rows of enthusiastic students, in the gala carriages of the municipality, to the Hotel Royal des Étrangeres, where a handsome suite of apartments, along with equipages and numerous attendants, was placed at our disposal. We were there received by the committee in charge of the festivities, Prince BELMONTE and Cavalier RICCO, who afterwards, during our stay in the city, in the kindest way arranged everything to make our stay there festive and agreeable.

It is impossible to describe in detail all the generous attentions we received and all the honours conferred upon us. On Sunday the 22nd there was a public meeting of the Geographical Society, at which its grand gold medal was presented to Nordenskiöld. In the evening a grand dinner, given by the Geographical Society, in the Continental Hotel. Among the toasts which were drunk may be mentioned one to the King of Sweden and Norway, proposed in a very warm and eloquent speech by the Premier, CAIROLI; to Nordenskiöld, by Prince TEANO; to Palander, by the Minister of Marine, Admiral ACTON; to the other members of the Expedition, to its munificent patrons, Oscar Dickson and Alexander Sibiriakoff, to Bove, the Italian officer, who took part in it, &c.—On Monday the 23rd, we had an audience of the King, and in the evening a grand reception at the Palazzo Teano, where almost all that was distinguished and splendid of Roman society appeared to be assembled.—Tuesday the 24th. Dined at the Quirinal with King Humbert. There were present, besides the King and his suite, the Swedish minister, the members of the *Vega* expedition, Prince Teano, President of the Geographical Society; Commendatore Negri; Cairoli, Premier; Acton, Minister of Marine; MALVANO, Secretary of the Cabinet; Major BARATIERI, and the Italian naval officer, EUGENIO PARENT, a member of the Swedish Polar Expedition of 1872-3, and others. In the evening, reception by the English Minister, Sir A. B. PAGET, and

a beautifully arranged *fête* at the Scandinavian Union, at which a number of enthusiastic speeches were made, and flowers and printed verses were distributed.—Wednesday the 25th. Farewell visits. Some of the members of the Expedition travelled north by rail. Captain Palander made an excursion to Spezia to take part in a cruise on the large ironclad *Duilio*. The others remained some days longer in Rome in order to see its lions, undisturbed by official *fêtes*.

On the 29th February the *Vega* left the harbour of Naples, but no longer with her staff complete. At our departure the gun-room *personnel* consisted only of myself, Captain Palander, and Lieuts. Brusewitz and Hovgaard.

We sailed through the Straits of Gibraltar on the 9th March, and anchored in the harbour of Lisbon on the 11th March at 2 p.m. Here we were received in audience by the King. On Monday the 15th we were present by special invitation at a meeting of the Geographical Society, at which the King honoured us with decorations.

After being otherwise *fêted* we weighed anchor again on the 15th March, but it was not until the evening of the 25th March, considerably later than we had counted on, that we could anchor in the harbour of Falmouth, not, as was first intended, in that of Portsmouth. We thus missed some preparations which had been made at the latter place to welcome us to the land which stands first in the line of those that have sent out explorers to the Polar Seas. We besides missed a banquet which the Royal Geographical Society had arranged in honour of the *Vega* expedition, at which the Prince of Wales was to have presided, and which now, in the midst of the Easter holidays and a keenly-contested parliamentary election, could not be held. Our stay in England, at all events, was exceedingly pleasant. Palander and I travelled on the night before Good Friday to London, where we were received at the railway station by the Swedish minister, Count PIPER, and a large number of our countrymen living in London. Count Piper carried me to my future host, the distinguished Secretary of the Geographical Society and famous geographical writer, CLEMENTS R. MARKHAM, who did every-

thing to make my stay in London as pleasant and instructive as possible.¹

We started for Paris on the night of March 31st. We went by Boulogne-sur-Mer, where we were handsomely received on April 1st, and travelled by night to Paris, arriving there on the 2nd April at 7 a.m.

Our reception in Paris was magnificent, and it appeared as if the metropolis of the world wished to show by the way in which she honoured a feat of navigation that it was not without reason that she bears on her shield a vessel surrounded by swelling billows. It is a pleasant duty for me here to offer my thanks for all the goodwill we, during those memorable days, enjoyed on the part of the President of the Republic, of Admiral LA RONCIÈRE LE NOURY, President of the Geographical Society, his colleague, M. HECHT, M. MAUNOIR, the Secretary of the Society, M. QUATREPAGE, and M. DAUBRÉE, members of the Institute, not to forget many other Frenchmen and Scandinavians. Among the *fêtes* of Paris I must confine myself to an enumeration of the principal ones.

Friday, the 2nd April. Public *séance de réception* by the Geographical Society in the Cirque des Champs Elysée in the presence of a very large and select audience. Admiral La Roncière delivered the speech on this occasion, which I replied to by giving a pretty full account of the Swedish Arctic expeditions, on which the President handed me the large gold medal of the Society "as a proof of the interest which the public and the geographers of France take in the voyage of the *Vega*." Saturday the 3rd. Invitation to a festive meeting of delegates from twenty-eight learned societies in France in the amphitheatre of the Sorbonne.² We were greeted by the Minister of Education in a masterly and eloquent speech, after which he conferred upon

¹ During our visit to London we had no opportunity of taking part in any of the meetings of the Society, but some time after the Society gave Palander the Founder's Gold Medal (I had in 1869 obtained the same distinction) and elected me an Honorary Corresponding Member.

² These are enumerated in the *Bulletin de la Société de Géographie*, Mai, 1880, p. 463. In the same part (p. 450) there is also a report of the speeches made at the *séance de réception*.

us, on the part of the Republic, Commander's and Officer's Insignia of the French Legion of Honour: "A reward," as the Minister of the *Republic* expressed himself, "for the blood of the brave and the sleepless nights of the learned." After that an official dinner and reception by M. Jules Ferry.—On Sunday the 4th, an address was presented from the Scandinavian Union, under the presidency of Herr Fortmeijer. In the evening a brilliant entertainment on a large scale given by the Scandinavian Union in the Hotel Continental. Among those present may be mentioned Prince OSCAR of Sweden, the President of the *Fête* Committee, Herr JENSEN, Fru KRISTINA NILSON-ROUZEAUD, the Danish minister, the Swedish embassy, members of the Russian embassy, a large number of Scandinavian artists, many of the principal representatives of the French and foreign press, and lastly, what ought perhaps to have been mentioned first, a flower-garden of ladies, of which every dweller in the north might feel proud.—Monday the 5th. Meeting of the Institute in its well-known hall, with speeches of welcome. Hence we were conducted to a grand festive reception, arranged beforehand to the minutest details by the Municipal Council, in "la Salle des États," situated in that part of the Tuileries where the Geographical Congress was held in 1878. The hall and the ascent to it were richly ornamented with French tricolours and Swedish flags, beautiful Gobelins, and living plants. A number of speeches were made, after which the President of the Municipal Council, on the part of the City of Paris, presented to me a large, artistically executed medal as a memorial of the voyage of the *Vega*.¹ In the evening a grand dinner was given by the Société de Géographie, with several eloquent speeches: for King Oscar (General Pittié), for President Grévy, for the prosperity of France (Prince Oscar), for the *Vega* expedition (M. Quatrefage), and so on.—Tuesday the

¹ The medal was accompanied by an "extrait du registre de procès-verbaux du conseil municipal de la ville de Paris," a caligraphic masterpiece illuminated in various colours and gold. The *Conseil municipal* also ordered a detailed description of the *fête* to be printed, with the title *Relation officielle de la réception de M. le Professeur Nordenskiöld par le conseil municipal de Paris le lundi 5 Avril 1880*.

6th. Dinner given by the President of the Republic, M. Grévy, to Prince Oscar and the *Vega* men then in Paris.—Wednesday the 7th. Dinner given to a numerous and select company of French *savants* by the then President of the Geographical Society and of the Institute, M. A. Daubrée.—Thursday the 8th. Dinner to a small circle at Victor Hugo's house, where the elderly poet and youthful-minded enthusiast in very warm, and I need not say eloquent words, congratulated me on the accomplishment of my task. Reception there the same evening.

Here ended our visit to the capital of France. Thoroughly exhausted, but bringing with us memories which shall never pass away, we travelled the following day to Vlissingen, whither the *Vega* had gone from Falmouth, under the command of Brusewitz. We had been compelled to decline warm and hearty invitations to Holland and Belgium from want of time and strength to take part in any more festivities. The anchor was weighed immediately after we came on board, and the course shaped for Copenhagen, where we arrived on the 16th, and were royally treated on all hands.

It was settled that our entry into Stockholm should take place in the evening of the 24th April, but we started from Copenhagen as early as the night before the 20th in order to be sure that we should not, in consequence of head winds or other unforeseen hindrances, arrive too late for the festivities in the capital of Sweden. As a result of this precaution we arrived at the archipelago of Stockholm as early as the 23rd, so that we were compelled during the night between the 23rd and 24th to lie still at Dalarö. Here we were met by Commander LAGERCRANTZ, who by the King's orders brought our families on the steamer *Sköldmön* to meet us.

On the 24th at 8 a.m. the *Vega* again weighed anchor in order to steam on slowly, past Vaxholm into Stockholm. We met innumerable flag-decked steamers by the way, fully laden with friends, known and unknown, who with shouts of rejoicing welcomed the *Vega* men home. The nearer we came to Stockholm, the greater the number of steamers, which, arranged in a double line and headed by the *Vega*, slowly approached the



THE CREW OF THE "VEGA."
(After a photograph taken at Naples.)

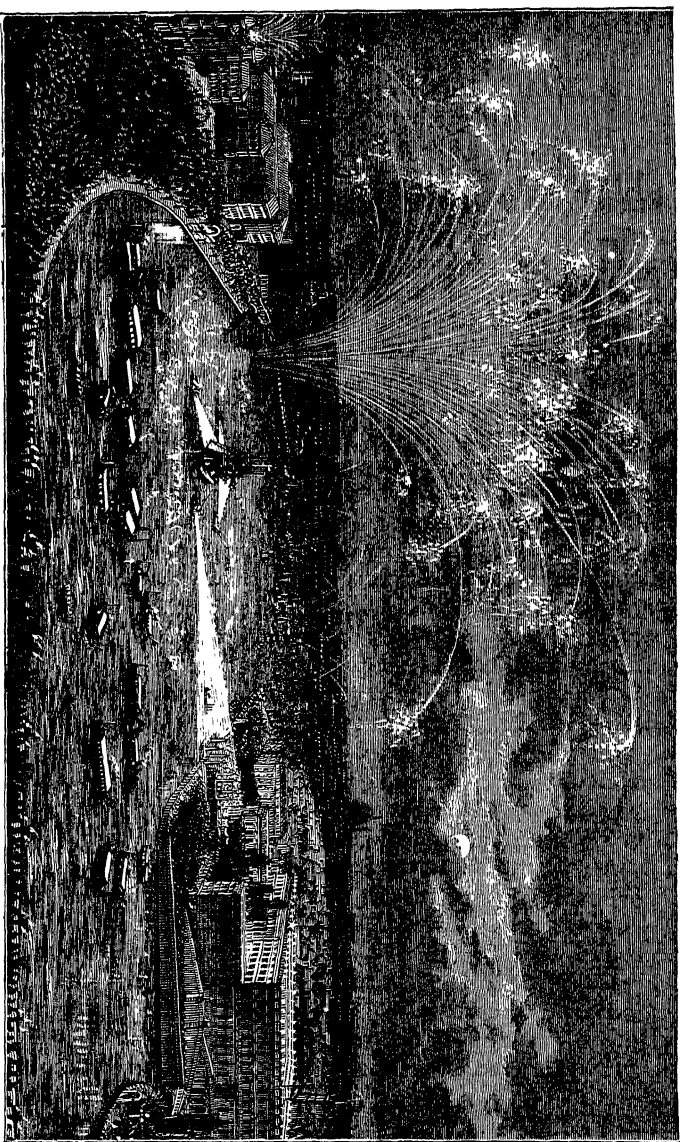
harbour. Lanterns in variegated colours were lighted on the vessels, fireworks were let off, and the roar of cannon mingled with the loud hurrahs of thousands of spectators. After being greeted at Kastelholmen with one salute more the *Vega* anchored in the stream in Stockholm at 10 p.m.

The queen of the Malar had clothed herself for the occasion in a festive dress of incomparable splendour. The city was illuminated, the buildings round the harbour being in the first rank. The King especially had done everything to make the reception of the *Vega* expedition, which he had so warmly cherished from the first moment, as magnificent as possible. The whole of the Royal Palace was radiant with a sea of lights and flames, and was ornamented with symbols and ciphers in which the name of the youngest sailor on the *Vega* was not omitted.

A platform had been erected from Logaorden to the landing-place. Here we were received by the town councillors, whose president, the Governor, welcomed us in a short speech; we were then conducted to the Palace, where, in the presence of her Majesty the Queen of Sweden, the members of the Royal House, the highest officials of the State and Court, &c., we were in the grandest manner welcomed in the name of the fatherland by the King, who at the same time conferred upon us further marks of his favour and goodwill.¹ It was also at the Royal Palace that the series of festivities commenced with a grand gala dinner, on the 25th of April, at which the King in a few magnanimous words praised the exploit of the *Vega*. Then *fête* followed *fête* for several weeks.

On the 26th the Swedish Yacht Club gave an entertainment in the Grand Hotel under the presidency of Admiral Lagercrantz. Among those who were present may be mentioned his Majesty the King, the Crown Prince, Prince Oscar, Oscar Dickson, and

¹ Among others, to all who took part in the Expedition a *Vega* medal, specially struck, to be worn on a blue-yellow riband on the breast. It may perhaps be of interest for numismatists to know that the medals distributed on account of the *Vega* expedition are to be found delineated in the eighth and ninth parts of the Swedish Family Journal for 1880. To those that are there delineated there have since been added a medal struck by the Finnish Society of Sciences, and the Anthropological-Geographical Society's medal.



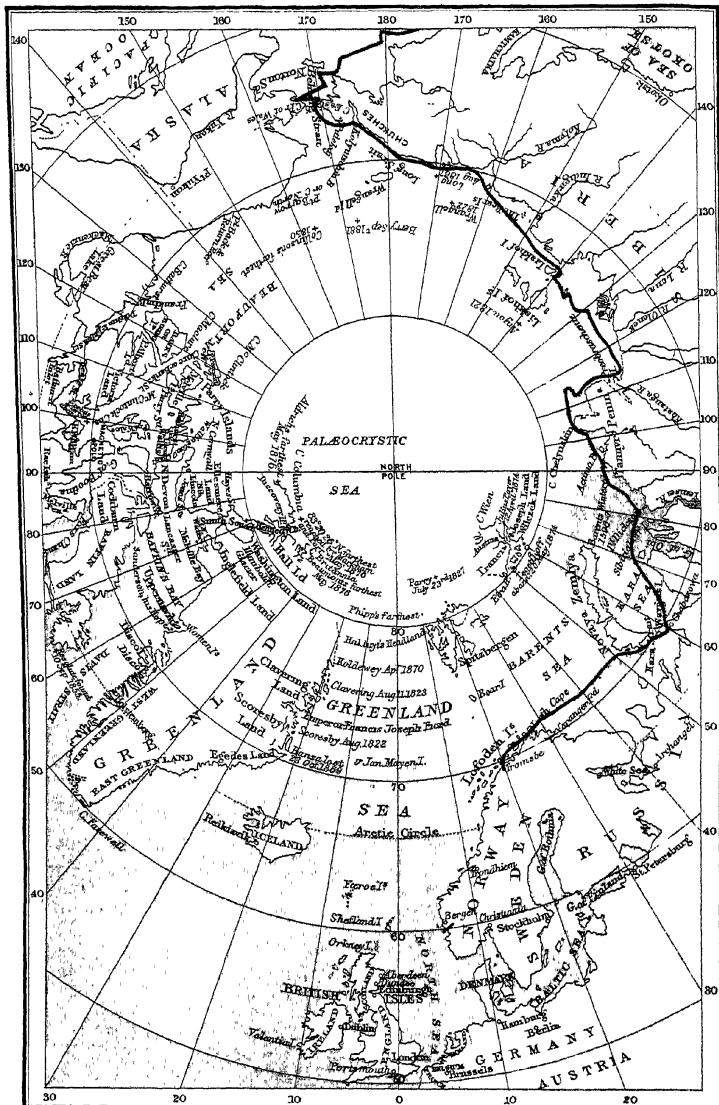
THE ENTRANCE OF THE 'VEGA' INTO STOCKHOLM ON THE 24TH APRIL, 1880.

Baron von Otter, Minister of Marine. On the evening of the same day there was a torchlight procession by pupils of the Technical High School. On the 27th there was a gala-play, to which all the *Vega* men were invited. On the 28th at a festive meeting of the Academy of the Sciences, a medal struck on account of the *Vega* expedition was distributed, the meeting being followed by a dinner given at the Phoenix Hotel by the Academy under the presidency of the Crown Prince. On the 30th April and 5th May banquets were given by the Publicist Club, and by the Idun Society, by the Naval Officers' Society to the officers of the *Vega*, and by the Stockholm Workman's Union to the crew. On the 7th and 8th May there were festivities at Upsala, the principal attraction of which consisted of gay, lively, and ingenious carnival representations, in which we received jocular addresses and homage from fantastically dressed representatives of the peoples of different countries and periods.

During this time there were daily received deputations, addresses, and telegrams of welcome, among others from the *riksdag* of Sweden, the *storting* of Norway, and the principal towns of Norway and Finland, from the students at Upsala and Helsingborg, from the St. Petersburg Geographical Society, from women in Northern Russia (the address accompanied by a laurel wreath in silver), &c. In a word, the Stockholm *fêtes* formed the climax of the remarkable triumphal procession from Japan to Stockholm, which stands unique in the history of festivities. Even after the Expedition was broken up in Stockholm, and the *Vega* had sailed on the 9th May for Karlskrona and Gothenburg, where she was again taken over by the whaling company that previously owned her, the *fêtes* were repeated at these towns. They commenced anew when the *Vega* exhibition was opened with appropriate solemnities by his Majesty the King in one of the wings of the Royal Palace, and when some months after I visited Berlin, St. Petersburg, and my dear old fatherland, Finland.

But I may not weary my reader with more notes of festivities. It is my wish yet once again to offer my comrades' and my own thanks for all the honours conferred upon us both in foreign lands and in the Scandinavian North. And in conclusion I wish

CIRCUMPOLAR MAP



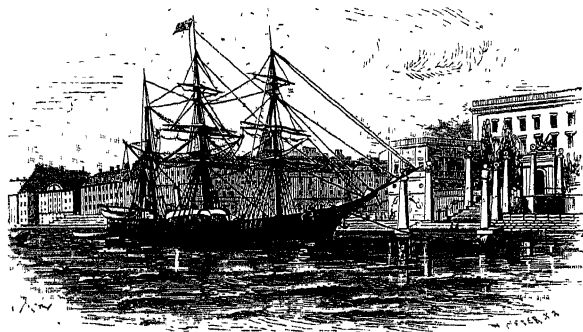
Track of the Vega.

London: Macmillan & Co

Standard Geog. Establishment London.

to express the hope that the way in which the accounts of the successful voyage of the *Vega* have been received in all countries will give encouragement to new campaigns in the service of research, until the natural history of the Siberian Polar Sea be completely investigated, and till the veil that still conceals the enormous areas of land and sea at the north and south poles be entirely removed,—until man knows at least the main features of the whole of the planet which has been assigned him as a dwelling-place in the depths of the universe.

Hearty thanks last of all to my companions during the voyage of the *Vega*; to her distinguished commander Louis Palander, her scientific men and officers, her petty officers and crew. Without their courage and the devotion they showed to the task that lay before us, the problem of the North-East Passage would perhaps still be waiting for its solution.



ABSTRACT OF THE VOYAGE OF THE VEGA.

		Distance traversed. English geographical miles.
	1878.	
Karlskrona—Copenhagen	June 22—24	144
Copenhagen—Gothenburg	„ 26, 27	134
Gothenburg—Tromsøe	July 4—17	1,040
Tromsøe—Chabarova	„ 21—30	930
Chabarova—Port Dickson	Aug. 1—6	580
Port Dickson—Cape Chelyuskin . .	„ 10—19	510
Cape Chelyuskin — Preobraschenie Island	„ 20—24	385
Preobraschenie Island—The Mouth of the Lena	„ 24—27	380
The Mouth of the Lena—Irkaiij . .	Aug. 27—Sept. 12	1,260
Irkaiij—Pitlekaj	Sept. 18—28	235
<i>The Wintering</i>	Sept. 28, 1878— July 18, 1879	
	1879.	
Pitlekaj—St. Lawrence Bay	July 18—20	190
St. Lawrence Bay—Port Clarence . .	„ 21, 22	120
Port Clarence—Konyam Bay	„ 26—28	160
Konyam Bay—St. Lawrence Island . .	„ 30, 31	90
St. Lawrence Island—Behring Island .	Aug. 2—14	900
Behring Island—Yokohama	Aug. 19—Sept. 2	1,715
Yokohama—Kobe	Oct. 11—13	360
Kobe—Nagasaki	„ 18—21	410
Nagasaki—Hong Kong	Oct. 27—Nov. 2	1,080
Hong Kong—Labuan	Nov. 9—17	1,040
Labuan—Singapore	„ 21—28	750
Singapore—Point de Galle	Dec. 4—15	1,510
Point de Galle—Aden	Dec. 22—Jan. 7, 1880	2,200
	1880.	
Aden—Suez	Jan. 9—27	1,320
Suez—Naples	Feb. 3—14	1,200
Naples—Lisbon	Feb. 29—March 11	1,420
Lisbon—Falmouth	March 16—25	745
Falmouth—Vlissingen	April 5—8	345
Vlissingen—Copenhagen	„ 10—16	632
Copenhagen—Stockholm	„ 20—24	404
Total		22,189

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